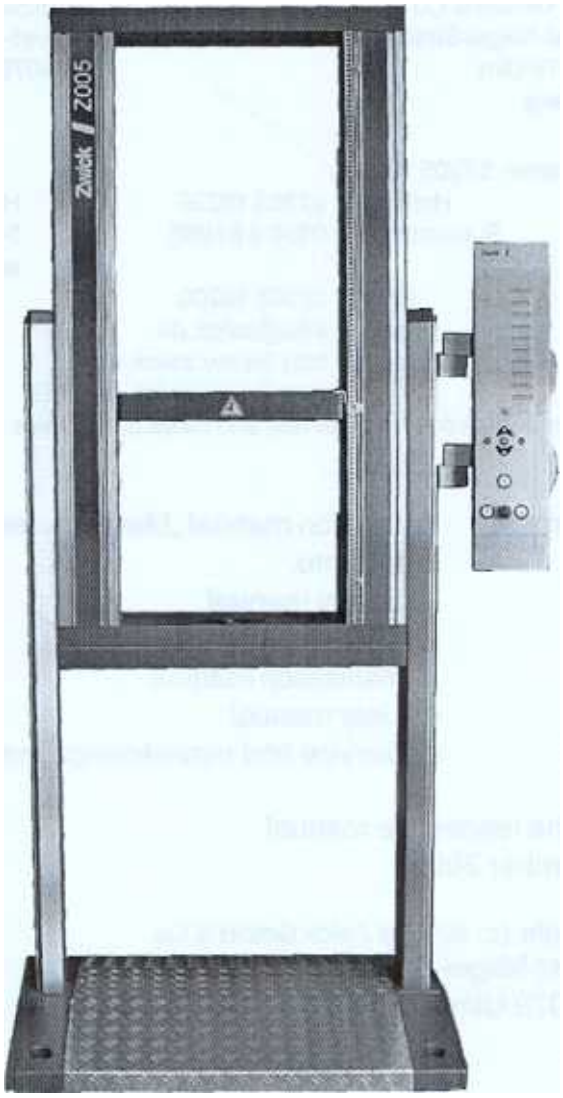
Instruction manual
for materials testing machines
T1-FR005TN.A50



Serial number: 168336
AB/Dossier number: 653782

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Section contents

Contents	Section
Safety manual	1
Technical manual	2
Installation manual	3
User manual	4
Reserved for expanded operation tC-OPSTDAL	5
Reserved for retro-fit parts instruction manual	6
Reserved for special user programs.	7
Free	8
Free	9
Service and maintenance manual	10
Circuit diagrams	11
Reserved for spare parts/wear and tear parts lists	12
Certificates/Calibration reports	13
Free	14
Appendix	15

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Reserved

These sections could contain the following documents corresponding to your purchased components.

Section 5: „Expanded operation"
Aimed at the operating personnel and describes the possibilities of operation without a PC.

Section 6 „Retrofit parts"
is without documents in the initial delivery. You can file away the description(s) of subsequently supplied parts in this section.

Section 7 „Special user programs"
Contains an introduction to the purchsed PC software.

Section 12 „Spare parts/Wear and tear parts"
are not contained in the instruction manual as standard.

Section 13 „Certificates /Calibration reports"
The declaration of conformity or the manufacturer's declaration, calibration reports, safety data sheets and other certificates are to be found in this section.

Directories

The instruction manual uses contents and hit word indexes.

Lists of contents:	To be found on the third page of the respective section.
Hit words:	To be found at the end of the respective register.

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

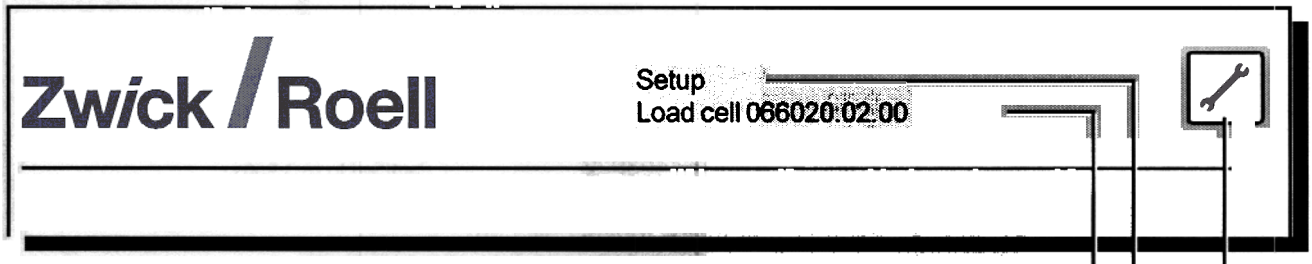
Each page of the instruction manual contains all important information on the

- Manual
- Chapter
- Device

as well as for

- Date of compilation
- File name
- Version of the description.

We'd like to make this clear to you with an example.



Device with order no.
(Electronics or type of drive system could be contained here)

Chapter
(These can be found in the respective list of contents)

Pictogram of the manual
(Navigation help)

File's date of compilation

File name

File's version no.

Please provide us with this information should you have any enquiries.?

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Manufacturing companies

Zwick Roell AG

Zwick GmbH & Co.

Zwick Series

- Electro-mechanical materials testing machines and accessories
- Test software
- Macro-hardness tester
- Plastics testers
- Melt index measurement devices
- Pendulum impact testers up to 750 J

Zwick projects

- Automated test systems
- magnet test devices
- Materials testing machines for loads greater than 250 kN
- Customised testing systems
- High-velocity testing machines
- Servo-hydraulic testing machines

ZwickService

- Installation
- Maintenance
- Accredited calibration service
- Spare parts supply
- Retrofits
- Refurbishment
- Used machines
- Tuition
- Tests ordered by a customer

Toni Technik
Baustoffprüfsysteme GmbH

- Servo-hydraulic testing machines
- Automated specimen preparation devices
- Chronometers
- Devices for determining hydration heat
- Complete laboratories
- Service and refurbishment of test machines

Indentec
Hardness Testing Machines Ltd.

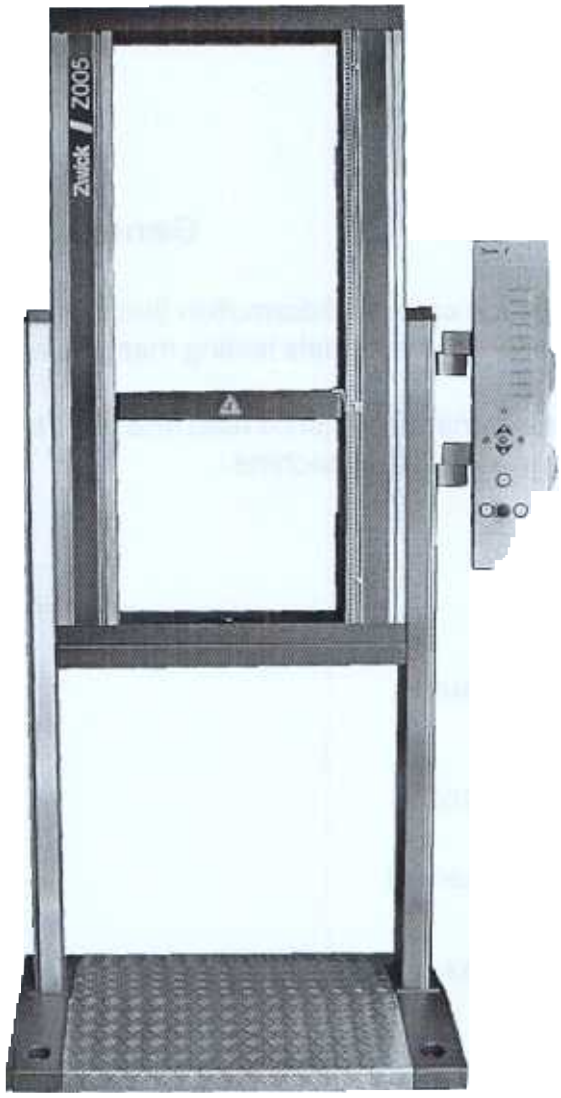
- Rockwell hardness testers
- Vickers hardness testers
- Brinell hardness testers

Acmel Labo
Building materials test equipment

- Devices for testing cement and mortar

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Section 1: Instruction manual Safety manual for the materials testing machine T1-FR005TN.A50



Serial number: 168336
AB/Dossier number: 653782

Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

List of contents

List of contents **3**

Introduction **5**

Supplements 5
Transport 6

Proper use **7**

Improper use 8
Remaining risks 9
Checks and preventive measures 10

Symbols and signal words **11**

Symbols on the test systems 11
Signal words in the instruction manual 12

Personnel **13**

Operator 13
Workplace 15

Safety measures and notes **16**

Before switching on 16
At operation 16
At Service and maintenance 21
When working with electrical equipment 22
When working on laser light sources 22
When working on hydraulic and pneumatic equipment 23

Cleaning and disposal **24**

Index **25**

Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

Introduction

The test system is manufactured to the state of the art technology and to recognised safety requirements. This, however, neither excludes any danger to life and limb of the operator or third parties which could occur when using the test system. Nor can interference nor impairment to the impact tester be excluded.

The test system may only be used if it is in perfect technical order as long as it is being used properly. At the same time safety and hazard risks as well as observation of the contents of the instruction manual must be taken into account. The test system must be shut down immediately should any interference occur that impairs safety. The interference or its cause must then be rectified.

Supplements

Supplement the user manual with instructions from national regulations on accident prevention and environmental protection.

Please observe and adhere to:
- Valid, binding regulations on accident prevention
- Recognised technical rules for safety and correct working
- Regulations on safety and health protection when preparing and using working means
- Instruction manuals

The entire instruction manual must always be available at the installation site of the test system.

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Proper use

Our materials testing machines can be used to determine properties on test pieces such as bars, shaped elements, components and etc. The testing machines apply mechanical loading to the test piece in the form of continuous, increasing, pulsating or cyclic tests through an electrical or hydraulic drive system.
The test pieces are loaded via the test quantities force, moment or deformation with defined values, time sequence and frequency.
The materials are undergo destructive or non-destructive tests depending upon the testing machine and test method used.
The classical types of test are tensile, compression, flexure and torsion test on the basis of a variety of test standards.

Please make sure that the specimen and specimen mountings used can neither be propelled away from the testing machine nor can drop to the floor when under load, or in the case of failure. This could lead to damge to test equipment and to injury to persons in the vicinity of the machine.

The instruction manual is constructed in modular form. Thus observe section 2 „Technical manual". This section describes the proper use of each component.

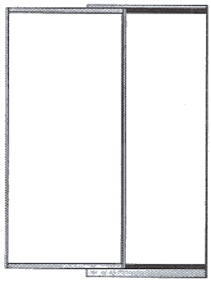
Inspection and maintenance, transport, installation and operating instructions belong to the proper use of the test system.

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Remaining risks

Remaining risks may be present in, for example, the following cases (For examples also see DIN 51233):

- Using hardened or ceramic jaw inserts without protection against shattered parts
- Danger of trapping fingers, etc. when opening and closing specimen holders which are electrically, hydraulically or pneumatically operated.
- Specimen or parts of specimen that are, or can be, propelled away from the test system or fall to the ground with high energy absorption and resilience owing to the type of loading and the propertires of the specimen, i.e.
  - Springs
  - Ropes
  - Belting



Basically we stipulate that the user is well versed in the use of the test system.

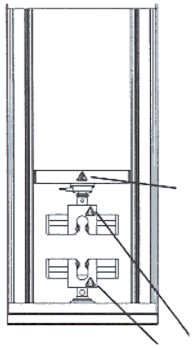
We offer a range of safety devices that are aimed at providing protection for the user and for the vicinity of the test equipment. We stipulate the use of a safety device with electrical interlocking for the test area depending upon the components and applications to be employed by and with the test system. In this case the maximum drive speed is limited to 600 mm/min and the test load is limited to the set preselections in verification operation. These limits apply when the safety door is open. Section 4 (Operator manual) explains the verification and test operation in more detail.
In addition inching operation has been realised at the testControl electronics.
The test itself is run only if the safety door is closed and interlocked.

The speed limit of 600 mm/min for opening and closing specimen holders is a safety precaution for pneumatic and hydraulic specimen holders.

Copyright © 2005, Zwick GmbH, D-89079 Ulm

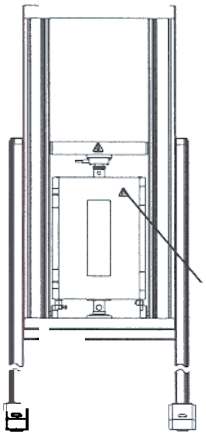
Symbols and signal words

Symbols on the test systems



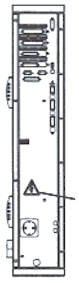
The following safety remarks can be fixed to the test system. Please pay attention to them.

Risk of injury!
The crosshead is moving.
Caution: Caution, **no** automatic shutdown if the crosshead is touched.

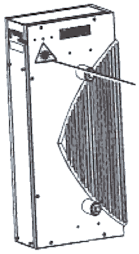


Risk of trapping parts of the body!
Specimen holders can be closed mechanically, manually or automatically.
Caution: Caution, **no** automatic shutdown if the specimen holder(s) is(are) touched.

Risk of burning or Risk of frostbite!
The temperature device can become extremely hot or cold.



Dangerous electrical voltage!
Only qualified electricians are to open the casing.



Laser beam!
Only competent and authorised persons may do any work on Lasers.

System display

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Personnel

A differentiation is made in this instruction manual between user and operating personnel.

User:	Responsible personnel with authority for giving instructions
Operating personnel:	Persons who work at or with the test system

Operator

The machine safety can only be implemented in every day use if all necessary measures are taken.
Determine the operating personnel's responsibilities for

- Operating
- Setup
- Maintenance and repairs

Tuition on the above is offered by Zwick

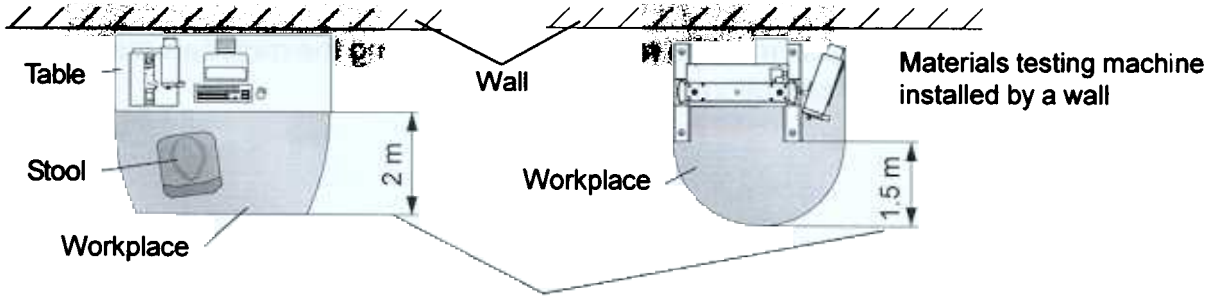
The test system's user must make sure that the following is observed (Due diligence).

The test system may only be used according to its proper use.
Only safe tests may be run with the test system
The test system may only be used if it is in perfect working order
Anything that could impede safety has neither been added nor converted
Safety devices have not been manipulated
Check all safety devices (Safety devices, limit switches, proximity switches and EMERGENCY OFF button) for evident malfunctions.
Should the test system malfunction in any way, further operation is permitted only following consultation with the responsible safety officer (If necessary please ask Zwick)
All safety remarks and warning signs attached to the test system must not be removed and must be legible.

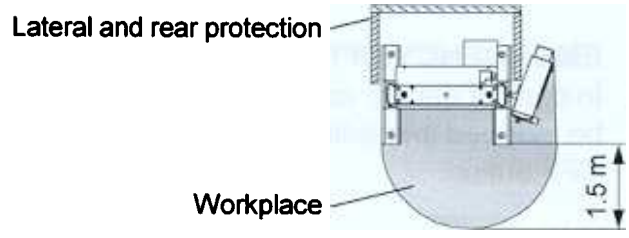
Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Workplace

The operator's workplace is in front of the materials testing machine during operation.

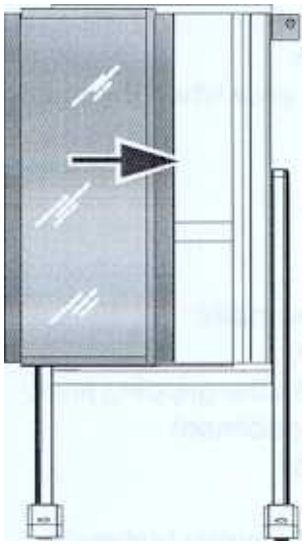


Materials testing machine setup free in a room



Exemplary drawing

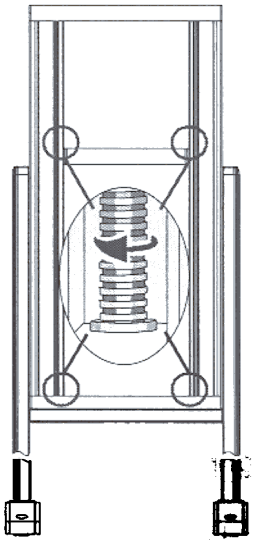
Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm



Safety device

Please use a safety device for any potentially dangerous test requirements (Safety door with electrical interlock).
Examples of potentially dangerous test conditions:

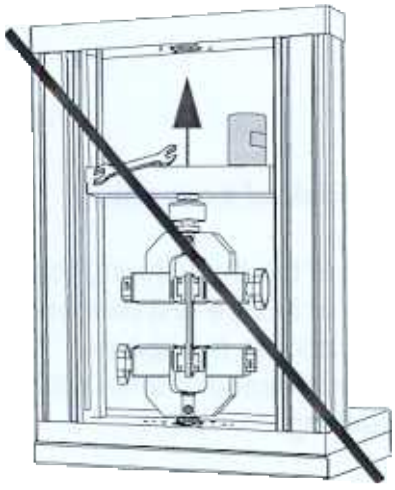
- Using hardened or ceramic jaw inserts without protection against shattered parts
- Specimen or parts of specimen that are, or can be, propelled away from the test system or fall to the ground with high energy absorption and resilience owing to the type of loading and the properties of the specimen such as
  - Springs
    Ropes
    Belting



Rotating lead screws

Be careful when lead screws, such as those for crossheads or extensometers are rotating.
Long hair, jewelry or loose clothing (E.g. sleeves) could get caught up in rotating lead screws.
Please take the following precautions

- Wear closely fitting clothing
- Do not wear jewelry
- Use a hairnet if necessary

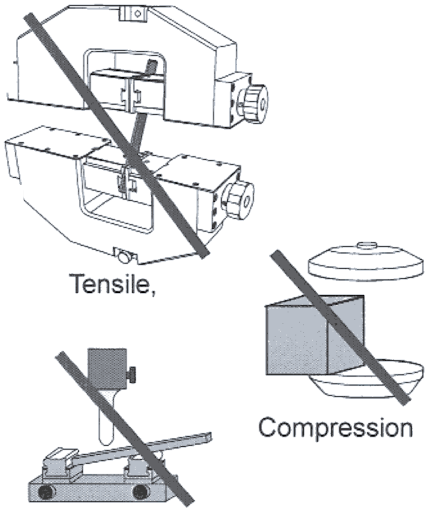


Working area

Risk of squashing and/or potential danger through falling objects.
Never place objects in the materials testing machine's test area nor on the test tools.

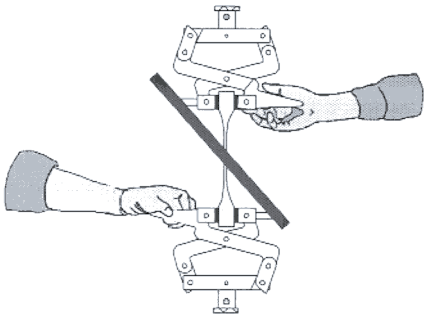
Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Spring tests
Danger of trapping parts of the body.
Danger of springs, or parts thereof, being propelled away from the test equipment.
Springs or spring components must neither move crosswise with respect to the test axis nor may they slip sideways.
Use an anti-buckle device and a shape fitting specimen mounting for tests on compression springs.
A safety device is necessary for the test area depending upon the type of test(s)!.



Insert the specimen
Potential danger through incorrectly clamped or placed specimen:
Parts of the specimen or jaw inserts could be propelled away from the testing system.
Check only correctly clamped/insertedspecimen. Off-centre testing may only be carried out with special tools.

Compression test devices may have a centring groove or a guide mandrel. The specimen must then either be seated in the groove or secured against being propelled away from the test device by the mandrel.



Open the grips
Potential danger through incorrectly clamped or placed specimen:
Parts of the specimen or jaw inserts could be propelled away from the testing system.
Never ever open specimen holders that are under load.
Any load must be removed from the clamped specimen before opening the specimen holders.

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

At Service and maintenance

Please note the following points to help avoiding serious injuries or machine damage when carrying out maintenance work on the test system. These topics are listed for each component in section 10 „Service and maintenance manual":

- Adhere to prescribed Inspection and maintenance intervals
- Please pay attention to the maintenance and service manuals.
- Only use the indicated operating fuels and lubricants, etc.
- Use original Zwick spare parts only

Before carrying out any maintenance or repair work:

- Switch the mains supply off via the main switch. Secure the main switch against inadvertant switching on with a padlock.
- Unplug the mains plug or disconnect the mains connection.
- Wait until all parts of the materials testing machine that may perhaps be touched (E.g. motor, temperature chamber, etc.) have cooled down to ambient temperature!

Check the following after maintenance or repair work:

- Have all threaded connections been screwed tight again?
- Have container lids/covers, sieves or filters that have been removed been replaced again?
- Have all materials, tools, equipment, etc. that were required for maintenance and repair work been removed from the materials testing machine's working area?
- Have any liquids that may have leaked been removed?
- Are all safety devices such as limit switches, proximity switches and the materials testing machine's EMERGENCY OFF button in perfect working order?

All of the above work must be first correctly done free of error before the materials testing machine is to be used by the operating personnel.

Only use lifting tackle (Such as a fork lift truck, crane, etc.) that is suitable and in first class condition when replacing or exchanging heavy machine parts!

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

When working on hydraulic and pneumatic equipment

Hydraulic

Maintenance and repair work on hydraulic and pneumatic equipment must only be performed by competent personnel trained and with experience in hydraulics/pneumatics!
When working with hydraulic oil please observe the corresponding remarks on the safety data sheet (Section 13 „Certificates/Calibration reports").

Set the materials testing machine to zero pressure when carrying out maintenance and repair work on pneumatic and hydraulic equipment!
These topics are listed for each component in section 10 „Service and maintenance manual"
Please check all leads, hoses and threaded connections for leakage and for visible damage!?
Replace any damaged hoses/pipes immediately!

Spraying oil could lead to injuries and fires!

Risk of slippage

As a precautionary measure, please replace all hydraulic hoses every 6 years (Recommendations to DIN 20066 Fluidics - Hoses) even if damage to them is not obvious!
Hydraulic oil may escape when cleaning the equipment.
Please make sure that emergency precautions (Oil sump, oil binders, etc.) have been taken to make sure that oil cannot intrude into the ground and/or the sewer system.
Please adhere to the safety data sheets for the hydraulic oil used and to the necessary rules and regulations.
Hydraulic oil and contaminated agents (Oil binders) must always be disposed of in an environmentally safe way. The safety data sheets are to be found in section 13 „Certificates/Calibration reports"
When replacing hydraulic and compressed air hoses, mount them in the same manner/direction.

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Index

A

Authorised personnel 13
Avoiding waste 24

B

Before switching on 16

C

Checks and preventive measures 10
Cleaning recommendations 24
Cold 20
Compressed air hoses 23
Compression tests 18

D

Definition
- CAUTION 12
- DANGER 12
- WARNING 12

Disposal 24
Disposal in an environmentally safe manner 24
Document 2

E

Ear protectors 20
EMERGENCY OFF button 13, 16, 21
Extensometer TC-EXOWMST.H01
- Safe operation 22

F

Flexure tests 18

H

Heat 20
Hoses 23
Hydraulic systems 14
Hydraulics 23

Insert the specimen 19
Inspection intervals 21
Instructing operating personnel 13
Instructing the operating personnel 13
Instructing the transport personnel . 6
Instruction manual 12

L

Laser 22
Lasers 20
Lifting tackle 21
Limit switch . 13, 16, 21

M

Machine safety 13
Mains connection 21
Mains plug 21
Maintenance 21
Maintenance intervals 21
Maintenance work
- Electrical equipment 22
- Hydraulic equipment 23
- Pneumatic equipment 23
- Switch off 21

Maintence work
- Environmental protection 24

Minimum distance 15

N

National regulations .. 5
Noise level 20

O

Oil sumps 14
Open the grips 19
Operate 16
Operation 13

P

Padlock 21
Perfect working order 13
Personnel 13
Personnels responsibilities 13
Pneumatics 23
Preventive measures 10
Print date 2
Proper use 7
Protection
- Clothing 14

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Section 2: Instruction manual Technical manual for the materials testing machine T1-FR005TN.A50

Serial number: 168336
AB/Dossier number: 653782

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

List of contents

General 2
Technical details **7**
Materials testing machine T1-FR005TN.A50 9
Measurement module TC-MODCSCC 21
TC-OP500HZ 23
Load cell, function description 25
Load cell TC-LC0020N.P01 29
Load cell TC-LC0200N.P01 31
Video extensometer TC-EXVIDEO.002 33
Environmental conditions and operating conditions 35
Index **39**

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Applied standards

The test standards relevant for materials testing machines are listed in the

Declaration of conformity
or the
Manufacturer's declaration

Remarks on product and manufacturer's liability

The accuracy limits stated in our specification(s) (order confirmation) are not infinitely valid. Regular checks must be made depending upon the measurement accuracy.
You can do this yourself if you have the necessary measurement means. If not, it can be done by accredited centres such as materials testing authorities or by Zwick. The Zwick DKD calibration laboratory is accredited under registration no. DKD-K-13201.

Remarks:
We recommend annual calibration with respect to EN ISO 9001

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

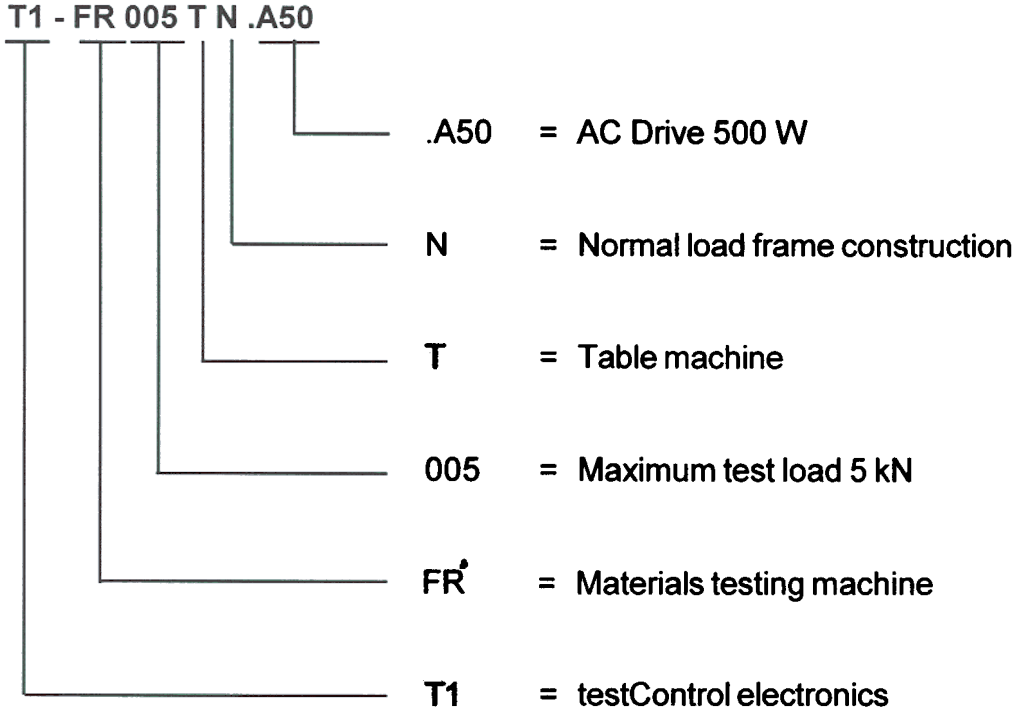
Technical details

This section contains the description of the materials testing machine with all accessories.
All technical details are contained here. The correct use of the materials testing machine and all accessories used with it are defined here. You can even read about impermissible application and use here.

Do you require the ratings or operating means still to be acquired? You'll find all values necessary for the materials testing machine here.

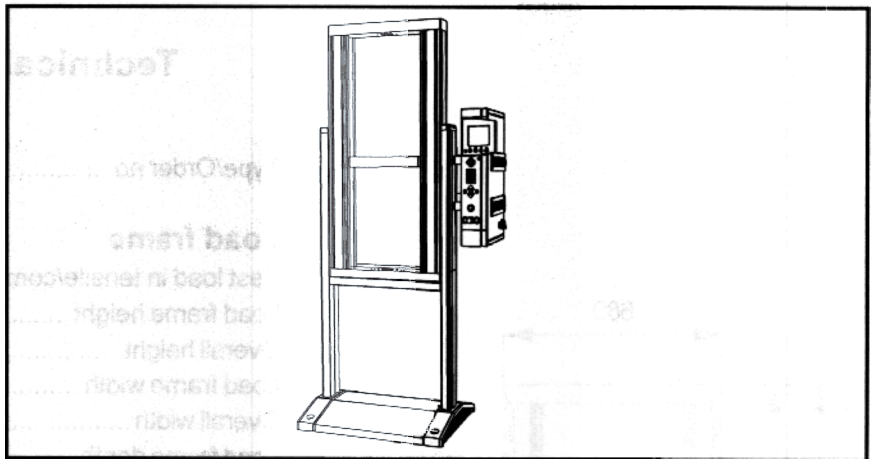
Materials testing machine T1-FR005TN.A50

The materials testing machine (MTM) described here is a table-top test machine with a max. test load of 5 kN. The machine identification (name) contains all characteristical details for this particular materials testing machine.

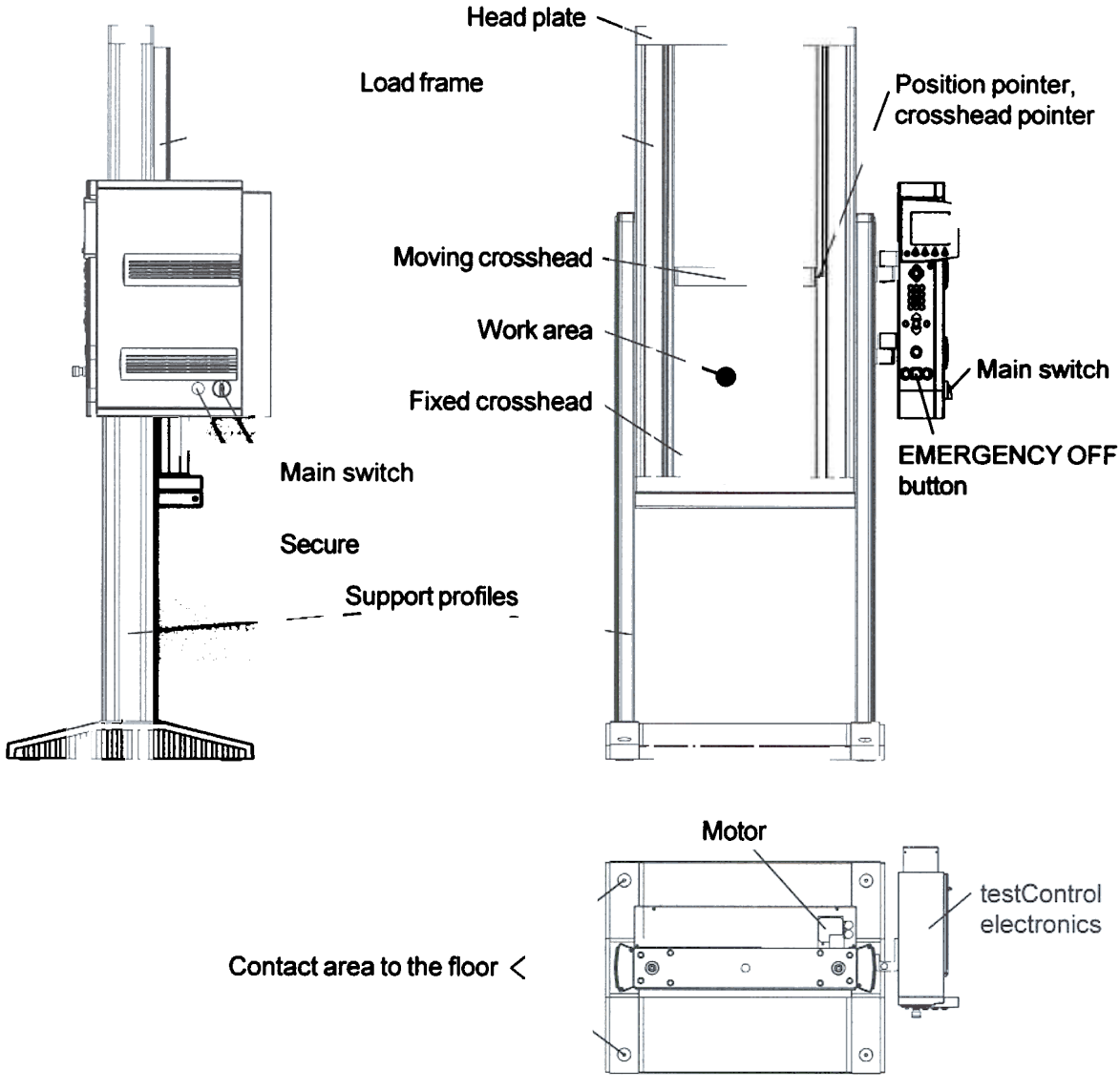

T1 - FR 005 T N .A50
.A50 = AC Drive 500 W
N = Normal load frame construction
T = Table machine
005 = Maximum test load 5 kN
FR = Materials testing machine
T1 = testControl electronics

Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

Materials testing machine T1-FR005TN.A50



Overview



Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

Measurement and control electronics

Test data recording rate in the system ..... 500 Hz
Test data transmission rate to the PC ..... Adjustable from 10 to 100 Hz
Number of module slots 2
Zero-drift correction of the entire measurement chain
without sensor ..... Automatic at measurement begin
Measurement signal, runtime correction ..... Yes
Output interface RS232
Required PC connection ..... COM 1
Type of protection, casing ..... IP 32

Remarks on the electronics

- A maximum of two test data recording p.c.bs can be installed in the electronics, the module slots are not expandable!

  The ventilation slits in the electronics unit must never be covered, not even those on the unit's underside. They require a free spacing of at least 100 mm.

  The testControl electronics must have a constant temperature for exact measurements. Thus switch the materials testing machine on an hour before the beginning of test, especially for long term tests.

Force measurement

The measurement electronics for the force measurement corresponds to ISO 7500/1

Load cell, type I

Grade 1	In the range of 0.4 to 100 % of F_{nom}.
Grade 0.5	In the range of 2 to 100 % of F_{nom}.

Load cell, type II

Grade 1	At F_{nom} >= 500 N in the range of 0,2 to 100 %,
	At F_{nom} <= 200 N in the range of 0.4 to 100 %,
Grade 0.5	In the range of 1 to 100 %

The percentage values refer to the nominal force (F_{nom}) of the connected load cell.

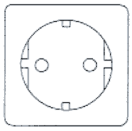
Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

Operating data

Rated values

Electrical connections	230 V (Ph, N, PE)
Full load current consumption	9 A
Power consumption (Full load)	1.9 kVA
Mains frequency	50/60 Hz
Mains fusing for the power supply	<= 16 A

Mains output



Socket	CEE 7 (Schuko)
Voltage	230 V (1PH, N, PE)
Mains drift	± 15 %
Maximum loading	1 kW

Leakage current monitoring

The materials testing machine is works equipped with interference suppression filters (EC laws). Interference suppression filters have leakage current to earth. This current is monitored by your installed leakage current monitoring devices (FI circuit breaker). A single materials testing machine doesn't trip a leakage current monitoring with 30 mA. Should your power supply be subjected to heavy interference, or if several materials testing machines are operated on one common FI circuit breaker, the sum of leakage currents could trip the FI circuit breaker.

You can help yourself by

- Running one materials testing machine on one FI circuit breaker

or

- Use an earth leakage circuit breaker with a higher response threshold if this is permitted

or

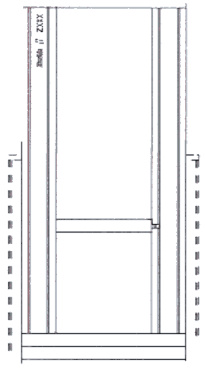
If your national laws and regulations, or works regulations allow it then don't use an FI circuit breaker.

or

- Use a DC isolated series transformer such as our BTC-ACTRAFO.230 for example.

Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

Function description



The materials testing machine's load frame, and the electronic measurement and control unit of the testControl machines constitute the basic unit for testing a range of materials. The load frame consists as standard of two guide profiles with integrated, play-free ball lead screws, a fixed lower and a moveable central crosshead as well as a head plate. The mechanical drive system is to be found in the base.
A bellows cover integrated in the guide profile protects lead screws and guide even if there is an extremely large amount of fibrous remains, fragments and dust.

The central mounting on the crossheads serves to mount test tools or load cells.

The materials testing machine's test area can be height adjusted by using the support profiles.

Proper use

The materials testing machine is concipated for quasi-static loading with increasing, pulsating or cyclic tests through an electro-mechanical drive system.
It has been designed for tensile, compression and flexure tests (see under EEC conformity declaration).

Limitation
The materials testing machine is not suitable for tests

On elastic specimen such as elastomers, springs or similar materials where the actual test load is 50 % greater than the machine's nominal force

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Should one or more of these sources of danger exist owing to the the testing machine's equipment or setup, a suitable safety device (e.g. safety door, shield, etc.) must be installed.

The safety device is used to protect the operator and the vicinity. Therefore the function of the safety device must never be deactivated

Improper use

Materials testing machines must not be put to use for any kind of applications whatsoever that constitute potential sources of danger for persons and for the environment.

Emissions

Heating up
The motor temperature can reach 80° C when performing cyclic tests (Continuous testing).

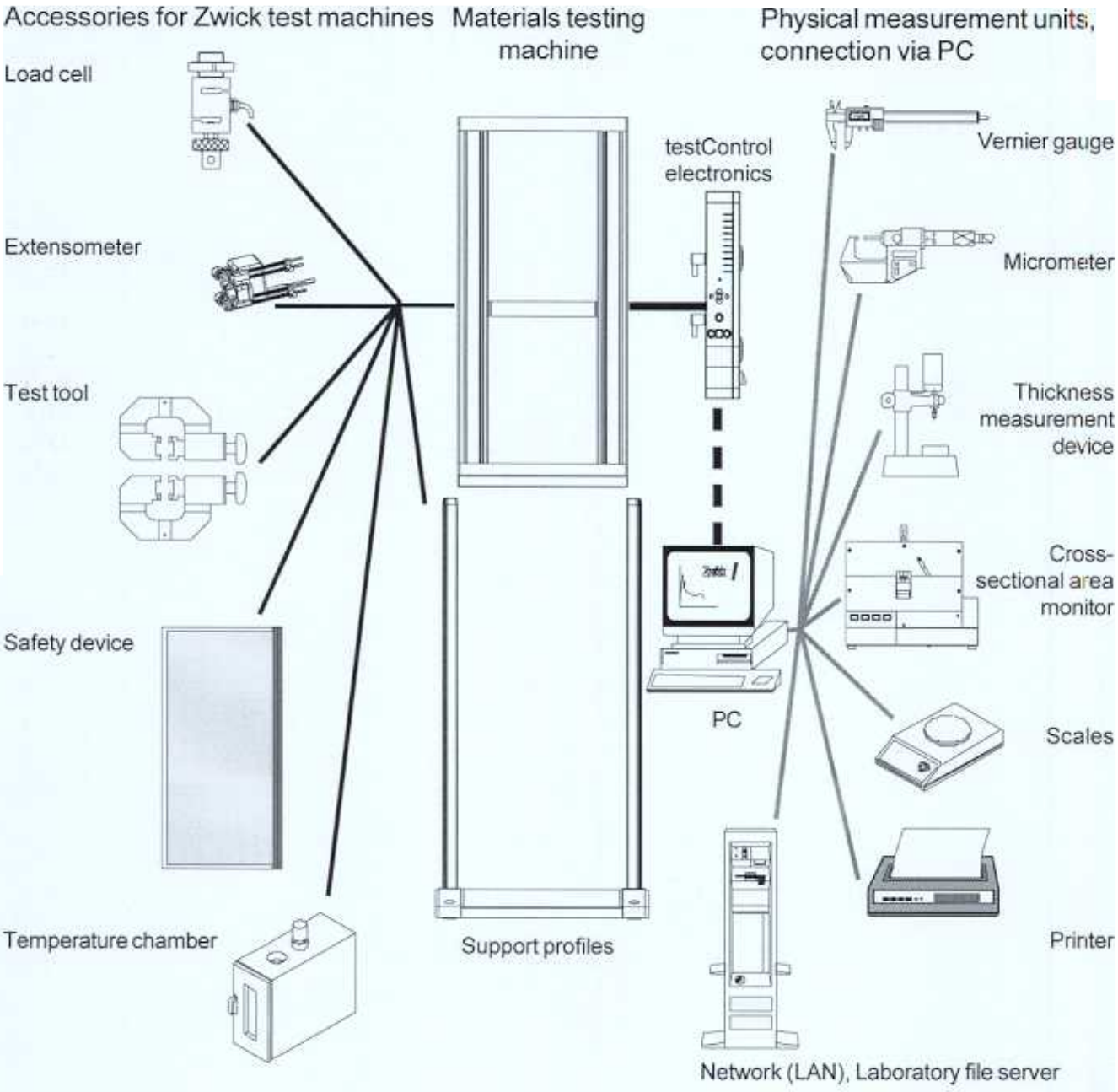
Free from vibrations
Vibrations and jolts at specimen break are dependent upon the material tested, and on the test arrangement.

Noise level
The materials testing machine's noise level is listed in the technical data. A loud noise can be generated at specimen failure (specimen break). We recommend the use of ear-protectors for such tests.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

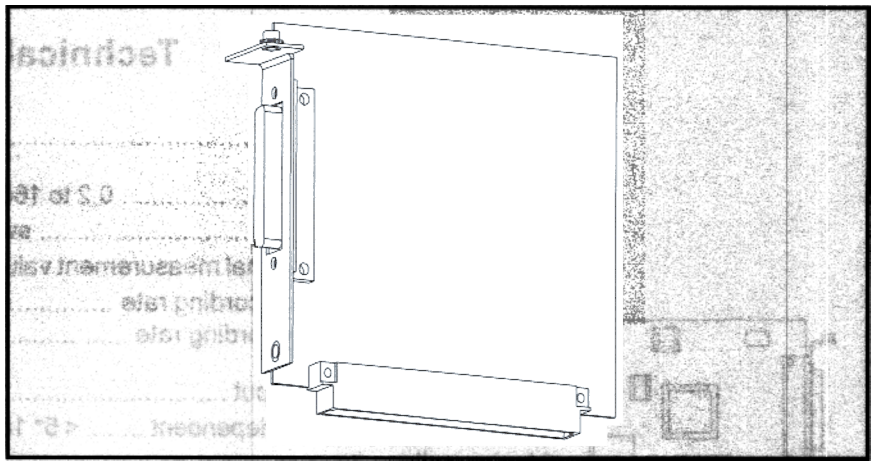
Accessories

The materials testing machine can be used with a wide range of accessories. The system elements and accessories listed here are only a part of the Zwick spectrum of products. You can direct any enquiries you may have on the Zwick range of products to your local representative or direct to Zwick in Ulm-Einsingen, Germany.

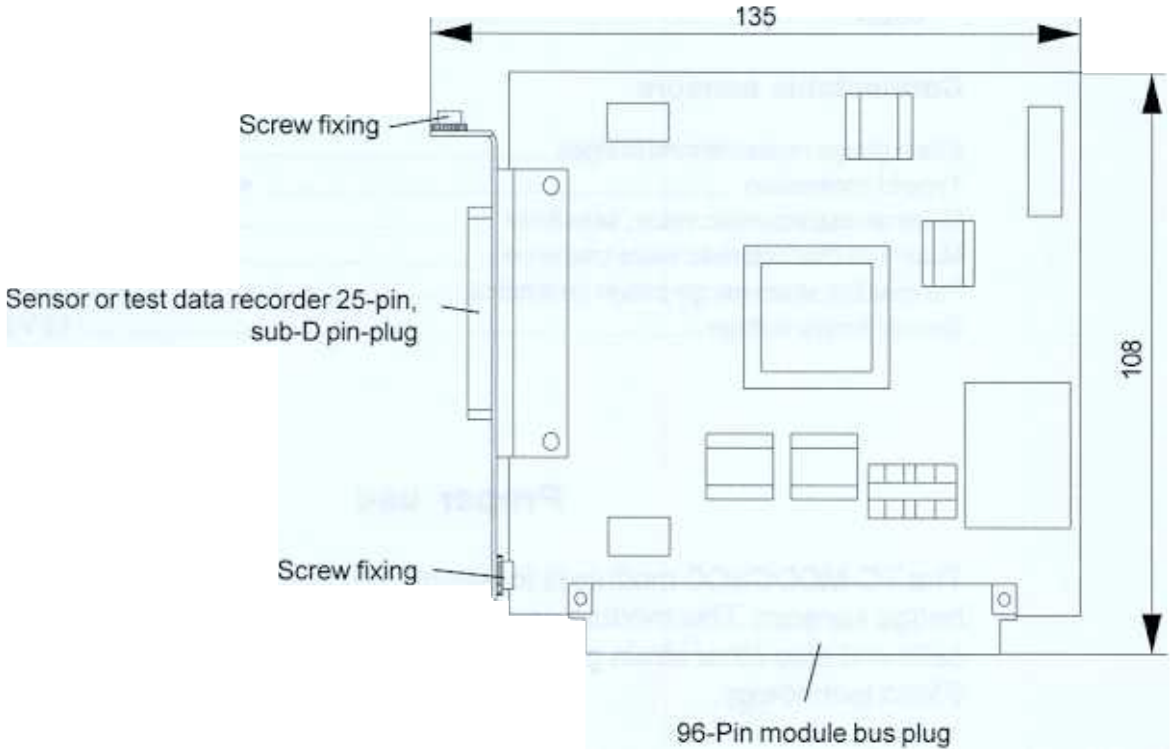


Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Measurement module TC-MODCSCC



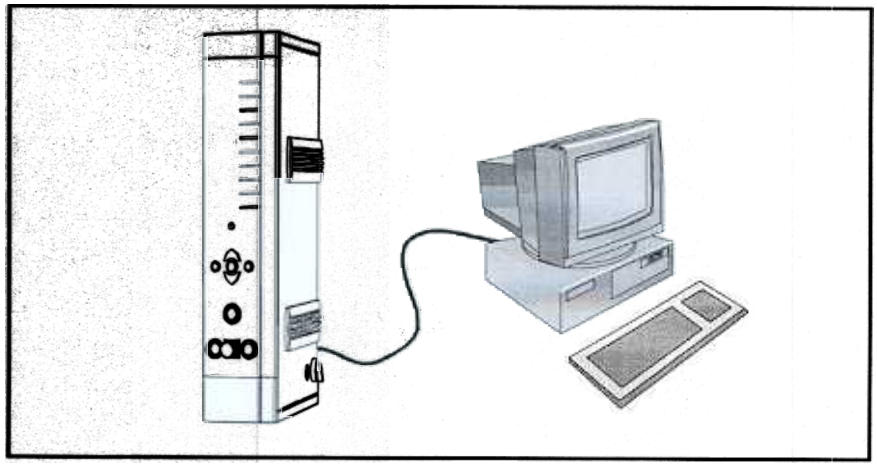
Overview



The TC-MODCSCC module is the link between a test data recorder with a strain gauge measurement bridge, e.g. a strain gauge load cell, and the testControl electronics.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

TC-OP500HZ



Option TC-OP500HZ

This option enables you to switch the transmission rate from 100 Hz to 500 Hz. Switching can be made in a test program at the PC only.

Technical data

Order no.	..... BTC-OP500HZ
Transmission rate ..... Software switching	100 Hz or 500 Hz

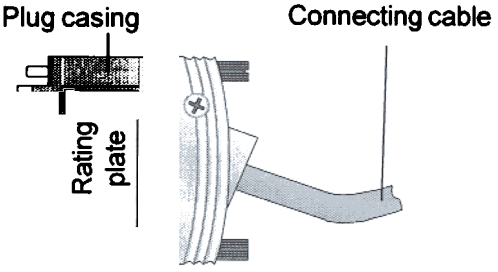
Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Load cell, function description

Load cells convert the physical quantity force to an electrical, measurable current. It consists of a mechanical deformation body with bonded strain gauges (StrG)
Strain gauges are strain dependent electrical resistances that are connected together to a measurement bridge.
The value of the measurement voltage at the measuring bridge output is analogue to the force (**F**) to be measured; this force acts on the deformation body and on the entire sensor system.
The sign (polarity) for the measuring voltage changes depending upon the tensile or compression loading of the load cell.

	Measuring voltage (-)
↖	Supply voltage (+)
	Measuring voltage (+)
↘	Supply voltage (-
Casing (mass)	Screen

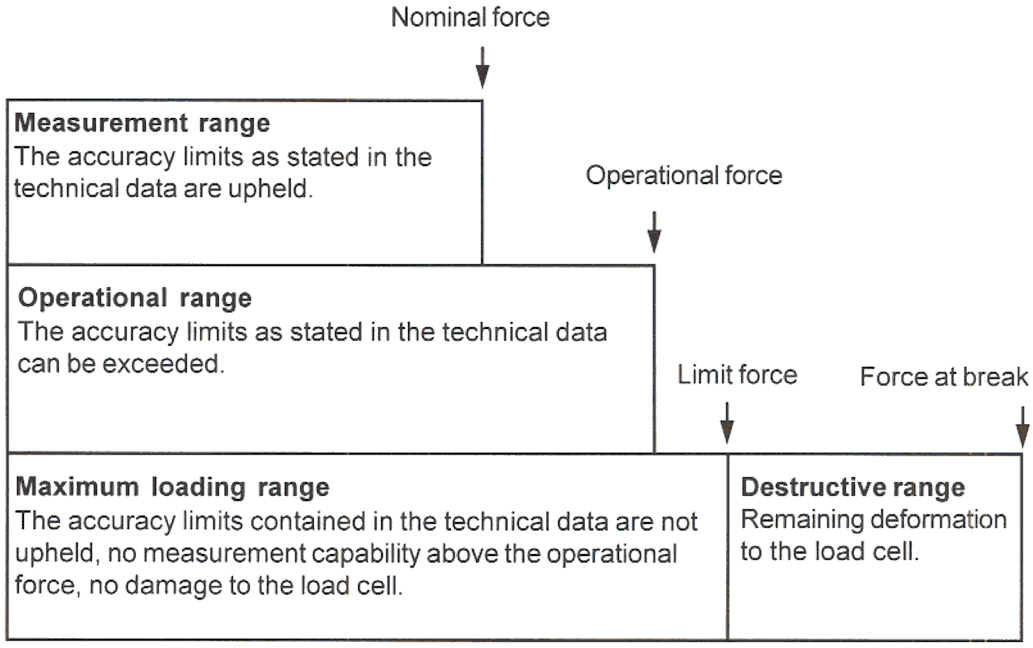
A first class, screened data cable with a 25-pin sensor plug establishes the connection to the measurement technology's measurement amplifier. The sensor plug's p.c.b. has a small data memory IC to which the load cell's characteristic and calibration data (important for the system setting) is saved.



Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Definition of the characteristics

The VDI/VDE guidelines 2638 (April 89) define the following characteristics for load cells:


Nominal force
Measurement range
The accuracy limits as stated in the technical data are upheld.
Operational force
Operational range
The accuracy limits as stated in the technical data can be exceeded.
Limit force
Force at break
Maximum loading range
The accuracy limits contained in the technical data are not upheld, no measurement capability above the operational force, no damage to the load cell.
Destructive range
Remaining deformation to the load cell.

Nominal force
F_{nom}

The nominal force for which the load cell has been designed.

Maximum operational force
F_G in N

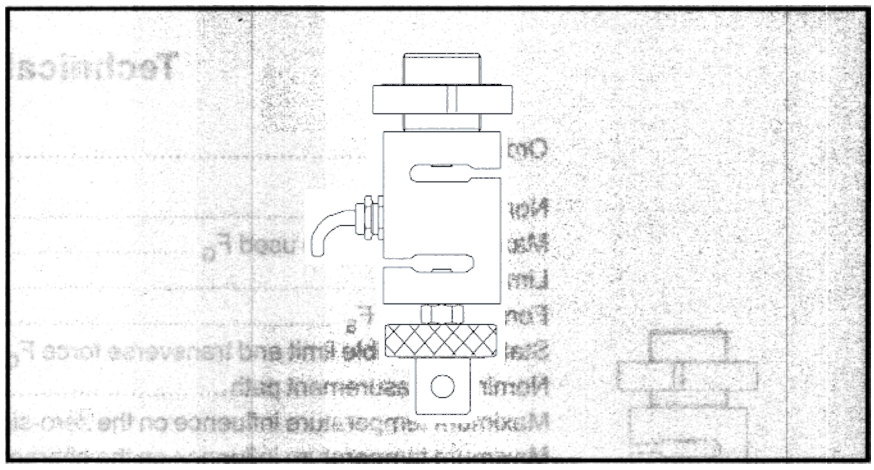
Greatest force in the direction of the load cell's measurement axis up to which a defined and repeatable relationship between the force and the output signal exists, however an eventually existing protection against overloading won't be tripped at this point.

Force at break
F_B in N

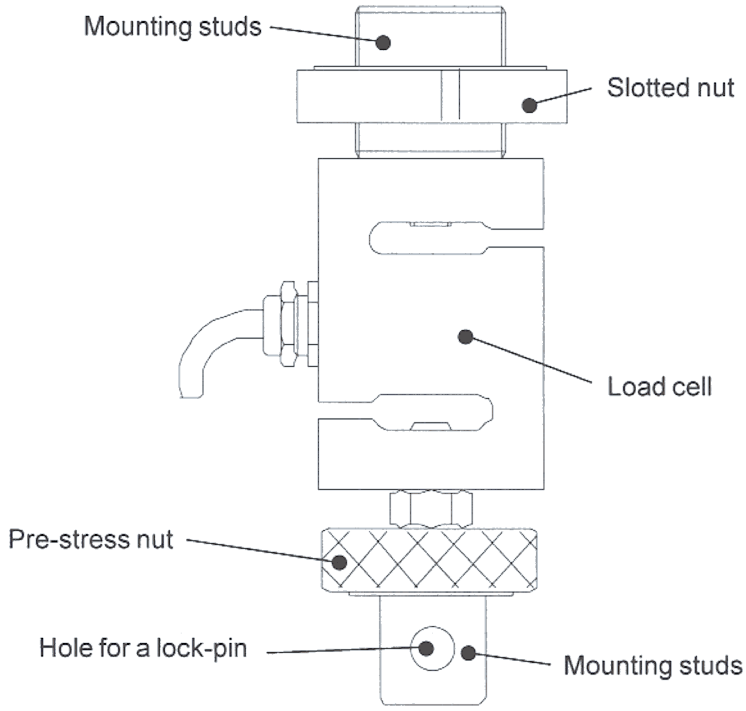
Force in the direction of the load cell's measurement axis above which mechanical destruction must be reckoned with.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Load cell TC-LC0020N.P01



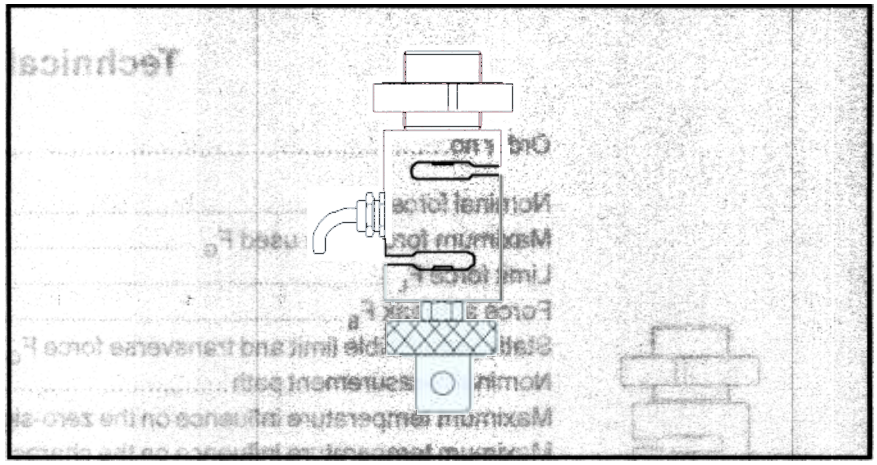
Overview



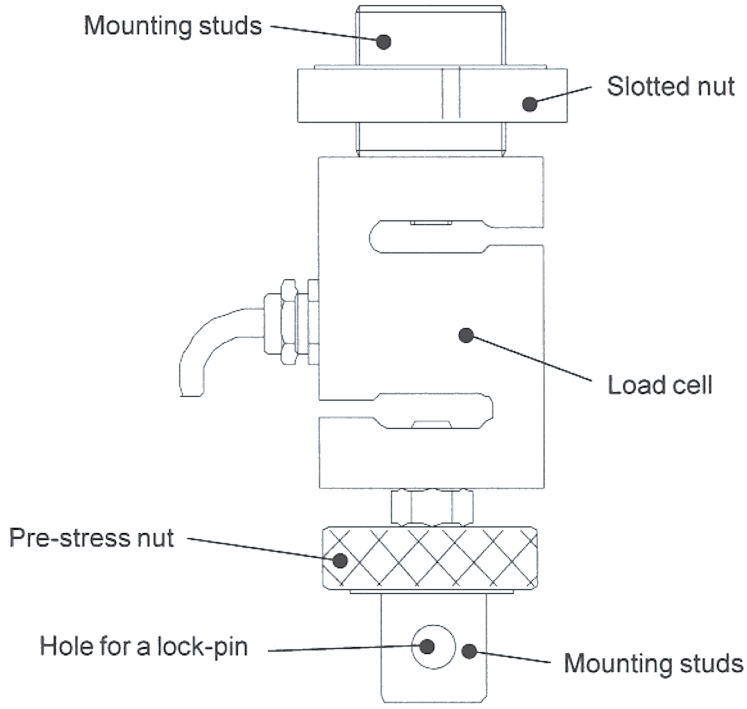
Load cells convert the physical quantity force to an electrical, measurable current.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Load cell TC-LC0200N.P01



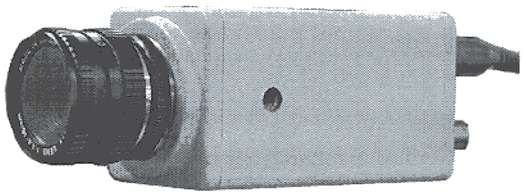
Overview



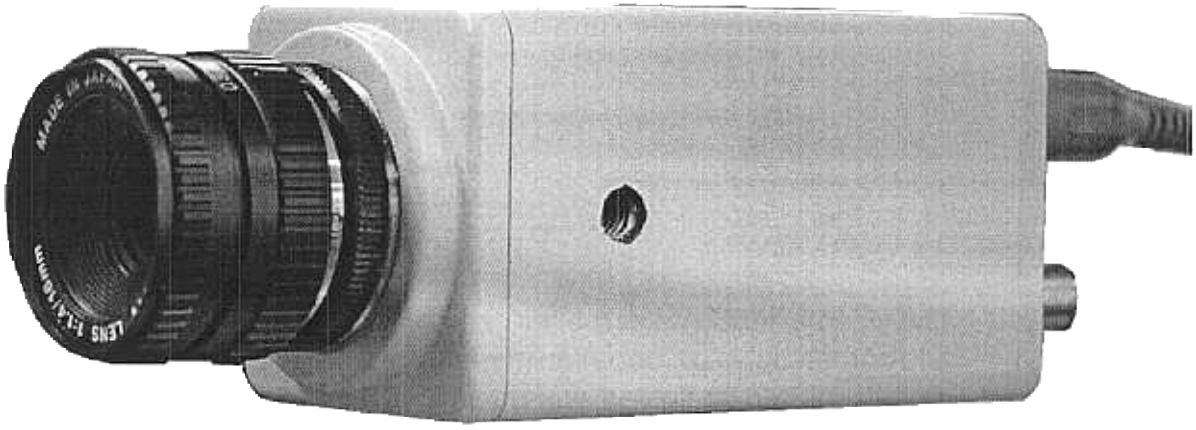
Load cells convert the physical quantity force to an electrical, measurable current.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Video extensometer TC-EXVIDEO.002



Overview



Function description

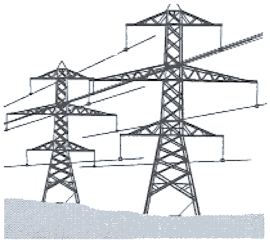
The surface of the specimen is digitised by the video extensometer. An analog measurement signal is generated depending upon the brightness of the captured surface area. This is then converted to a digital signal by the related measurement electronics and is then evaluated by a picture processing program on the PC.

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Environmental conditions and operating conditions

Our materials testing machines and testers are designed for use in atmospheres that are not an explosion risk. Please note that the user accepts liability to choose a safe installation site. Explosion protection guidelines also require that the explosion hazard and thus the resulting zoning must be taken into consideration.

The following conditions must exist at the site of installation to enable reproducible and exact results to be obtained. Otherwise the measurement results could be negatively influenced.



Mains

Voltage fluctuations ..... ≤ ± 10 % related to the nominal voltage connection as offered
Short term interference ..... ≤ 20 ms
Frequency ..... ± 1 % related to the nominal frequency as per our offer
Protective earthing .... Earth resistance ≤ 5 Ω

Suitable voltage stabilisators are required if strongly fluctuating mains voltages are to be reckoned with.

Temperature

Permissible range for Ambient temperature ..... +10 °C to + 35 °C
Permissible ambient temperature drift during a test ..... ± 1K
Humidity, non-dewing ..... 20 % to 90 %
Transport and storage temperature ..... - 25 °C to + 55 °C
Please make sure of sufficient ventilation. You must place a de-humidifying agent to the materials testing machine if it's to be stored for a lengthy period of time.

System operation emits heat depending upon the performance. Please take measures to ensure sufficient heat dissipation.

Type of protection

Corresponds to IP32 (To EN 60529).
The electronics is protected against:

- Solid foreign bodies with a diameter greater than 2,5 mm
- Dripping water if the casing is inclined up to 15°.

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Connection of computer systems/Peripherals

Devices connected to the materials testing machine must be within the radio interference limits.

Interference free operation is only possible if these devices are plugged into the materials testing machine's mains output sockets, or connected to the same phase plug as that for the materials testing machine. Whereby all cables should be as short as possible.

Compressed air

The materials testing machine does not require any compressed air. However, some of the optional test tools used in conjunction with the machines require compressed air.

Operating pressure	6 to 10 bar
with recommend oil to	ISO 3448
Viscosityt	32 mm²/s
	filtered, dehumidified and oiled

Water, Gases

The materials testing machines require neither water nor gas supplies. An exception is hydraulically operated testing machines and some optional auxiliary equipment/devices which need water and gas for cooling.
Please ensure sufficient ventilation for emission of gases.

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Index

A

Accessories
- Materials testing machine 19

Ambient temperature 35

C

Calibration 5
Characteristic value 28
Compressed air 37
Computer systems 37
Connection of computer systems 37

D

Definition
- Characteristic value 28
- Force at break 27
- Limit lateral force 28
- Maximum operational force 27
- Nominal force 27
- Operational force 27
- Permissible torque 28
- Static limit lateral force 28
- Temperature influence 28
- Torque 28

E

Electromagnetic fields 36
Electronic rating plate 12
Environmental conditions 35

F

FI Circuit breaker 13
Fire fighting equipment 18
Force at break 27
Free from vibrations 17
Function description
- Materials testing machine 15
- Video extensometer 33

G

Gases 37

H

Hazardous use 16
Heating up 17
Humidity 35

I

Identification 6
Improper use
- Load cell 30, 32
- Materials testing machine 17
- TC-MODCSCC module 22

Installation plan 38

L

Leakage current monitoring 13
Limitation 15
Limitations
- Video extensometer 34

Load cell 25
- Cable guide 26
- Characteristic value 28
- Data cable 25
- Data memory 25
- Definition of the characteristics 27
- Force at break 27
- Function description 25
- Maximum loading range 27
- Measurement range 27
- Nominal force 27
- Operational range 27
- Permissible torque 28
- Plug casing 25
- Static limit lateral force 28
- Temperature influence 28

Load cell TC-LC0020N.P01
- Improper use 30
- Overview 29
- Proper use 30
- Technical data 30

Load cell TC-LC0200N.P01
- Improper use 32
- Overview 31
- Proper use 32
- Technical data 32

Load cell's cable guide 26

M

Magnetic fields 36
Mains output 13
Mains requirements 35
Materials testing machine
- Accessories 19
- Electronic rating plate 12
- Emissions 17

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Force measurement 11
Function description 15
Hazardous use 16
Improper use 17
Load frame 10
Operating data 13
Overview 9
Proper use 15
Technical data 10
Technical details 7
Maximum operational force 27
Measurement amplifier 25
Measurement bridge 25

N

Noise level 17
Nominal force 27

O

Operating conditions 35
Operating data
Materials testing machine 13
Overview
Load cell 29, 31
Materials testing machine 9
TC-MODCSCC module 21
Video extensometer 33

P

Permissible torque 28
Power consumption 13
Proper use
Limitations 15
Load cell 30, 32
Materials testing machine 15
TC-MODCSCC module 22
Video extensometer 34

R

Rated values 13
Requirements for fixing 38

S

Serial number plate 6
Static limit lateral force 28
Storage temperature 35
Strain gauges 25
Structural requirements 38
System description
Video extensometer 34

T

TC-MODCSCC module
Connectable sensors 22
Improper use 22
Overview 21
Proper use 22
Technical data 22
TC-OP500HZ
Technical data 23
Technical data
Load cell 30, 32
Materials testing machine 10
TC-MODCSCC module 22
TC-OP500HZ 23
Video extensometer 34
Technical details 7
Temperature influence 28
Temperature requirements 35
Type of protection 35

V

Video extensometer TC-EXVIDEO.002
Function description 33
Limitations 34
Overview 33
Proper use 34
System description 34
Technical data 34

W

Water 37

Copyright © 2002, Zwick GmbH & Co., D-89079 Ulm

Installation plan

The space requirements are listed in the **Technical manual**under paragraph **Technical data**.

Storing accessories

Depending upon the accessories to be stored, you should have a lockable storage place (Cabinet or similar). This furniture hasn't been taken into consideration for the installation plan.
Why a cabinet that can be locked-up? Extensometers, load cells and physical measurement units such as Vernier gauges, micrometers, scales are measuring devices and must be well protected against damage.

Structural requirements

The specific loading of the floor for the materials testing machine is listed in the technical data. Please note that the height of the room must be approx. 20 cm higher than the test machine's maximum height (see the respective technical data).

Requirements for fixing

The materials testing machine is normally free standing, however, some hydraulic testing machines are fixed to the floor.
Align the machine and pay attention that it stands safely on its own on a level floor.

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

External influences
Materials testing machines and testers are highly sensitive measurement systems. Thus the following must be avoided at the installation site:

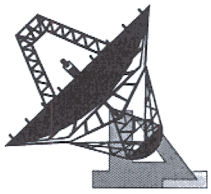
- Jolts and vibrations
- Oscillations
- Vibrations
- Schock
- Conducting air
- Corrosive contamination

Recommendation
Installing shock absorbers, air filters or signal filters.

We would be only too pleased to be of assistance to you should you be confronted with these problems.

Electrical, magnetic and electromagnetic fields

Our materials testing machines and testers are laid out to the now valid EMC guidelines.
The following measures have already been taken against the named interferences in the construction of materials testing machines with electronics consoles:



- Enclosed metallic casing.
- Screened leads.
- Connection of all devices and screens to the protective earthing.
- Star shaped reference conductor system.

You must take the following measures if the above ones are insufficient:

- Place power cables spacially separate to measurement leads.
- Use twisted wire pairs for self-made measurement leads, each wire pair should be separately screened (Screen mesh).
- Screen the materials testing machine from any nearby
  - Substations
  - Busbars
  - HF generators (Such as induction oven, welding gear, etc.)

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Technical data

Order no. BTC-EXVIDEO.002

This order no. for the video extensometer includes a video camera, a picture processing software and a PC hardware dongle.

The technical data for the video camera can be taken from the separate video camera instruction manual.

System description

The measurement system is a digital video camera with a picture processing system. The resolution and measurement range can be adapted to the properties of the materials to be tested by a suitable selection of camera lenses.
The picture of the specimen digitised by the video camera is processed in a PC supported video processor in real time.

Proper use

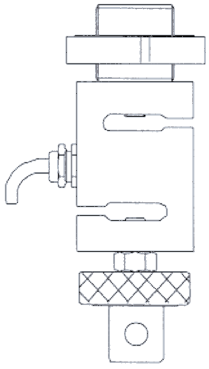
The video extensometer makes non-contact and high resolution tensile and compressive deformation measurements on all types of plastics, metals, rubber, laminates, wafers and foils.

Limitations

There is a risk of fogging in a temperature chamber when this extensometer is used in conjunction with Co_2 or LN_2 cooled temperature chamber. It may eventually be necessary to wait several minutes before proceeding with the test.
The temperature range of the temperature chamber is limited to -40 to +120 °C when using measurement marks on the specimen being tested.

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Technical data



Order no.	BTC-LC0200N.P01
Nominal force F_{nom}	200 N
Maximum force to be used F_G	120 % of F_{nom}
Limit force F_L	150 % of F_{nom}
Force at break F_B	>300 % of F_{nom}
Static permissible limit and transverse force F_Q	<= 10 % of F_{nom}
Nominal measurement path	0,1 mm
Maximum temperature influence on the zero-signal TK_0	± 0,05 % F_N/10 K
Maximum temperature influence on the characteristic value TK_C	± 0,05 % F_N/10 K
Measurement range, initial value:	
grade 1 0,4% of nominal value	0,8 N
grade 0,5 2,0% of nominal value	.. 4 N
Temperature range	-20 +60 °C
Type of protection ..	.... IP42
Model	.KAP-Z
Dimensions:	
Height	.. 86 mm
Width	.. 42 mm
Depth	.. 14 mm
Mounting studs	Ø 8 mm
Weight	0,3 kg

Proper use

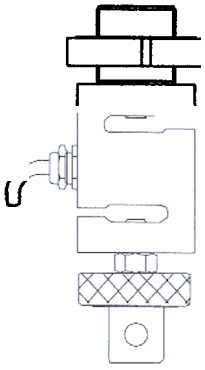
This load cell is designed for measuring static and dynamic tensile and compression forces. It must be operated in the direction of the test axis and to its nominal force whilst adhering to the conditions as contained under the technical data.

Improper use

Load cells are precision measurement devices and, as such, should be treated with the utmost care during transport and at assembly. They could become irreparably damaged if subjected to shocks and/or knocks.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Technical data



Order no.	BTC-LC0020N.P01
Nominal force F_{nom}	20 N
Maximum force to be used F_G	110 % of F_{nom}
Limit force F_L	150 % of F_{nom}
Force at break F_B	>500 % of F_{nom}
Static permissible limit and transverse force F_Q	<= 10 % of F_{nom}
Nominal measurement path	0,4 mm
Maximum temperature influence on the zero-signal TK_0	± 0,1 % F_N/10K
Maximum temperature influence on the characteristic value TK_C	± 0,1 % F_N/10K
Measurement range, initial value:	
grade 1 0,4% of nominal value	0,08 N
grade 0,5 2,0% of nominal value	0,4 N
Temperature range	-20 +60 °C
Type of protection	IP42
Model	KAP-Z
Dimensions:	
Height	81 mm
Width	60 mm
Depth	13 mm
Mounting studs	∅ 8 mm
Weight	0,3 kg

Proper use

This load cell is designed for measuring static and dynamic tensile and compression forces. It must be operated in the direction of the test axis and to its nominal force whilst adhering to the conditions as contained under the technical data.

Improper use

Load cells are precision measurement devices and, as such, should be treated with the utmost care during transport and at assembly. They could become irreparably damaged if subjected to shocks and/or knocks.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Static limit lateral force
F_Q in N

Greatest force that may be applied at the load cell's force introduction point vertical to the measurement axis without any significant changes to the load cell's measurement properties being detectable when using the load cell again up to its nominal force.
This is also valid at simultaneous loading of the load cell to nominal force.

Permissible torque torque
M_G in Nm

Permissible torque about the load cell's measurement axis without any significant changes to the load cell's measurement properties being detectable when using the load cell again up to its nominal force.
This is also valid at simultaneous loadingof the load cell to nominal force.

Characteristic value
C in mV/V

The output signal at nominal force is diminished by the pre-load signal.

Temperature influence to the characteristic value per 10 K
TK_C

Relative change to the characteristic value of the load cell owing to a change in the temperature by 10 k within a defined temperature range after setting the stationary states.

Temperature influence to the zero-signal per 10 K
TK_0

Changes to the load cell's zero-signal related to the characteristic value due to a temperature drift by 10 K within a defined temperature range after setting the stationary states.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

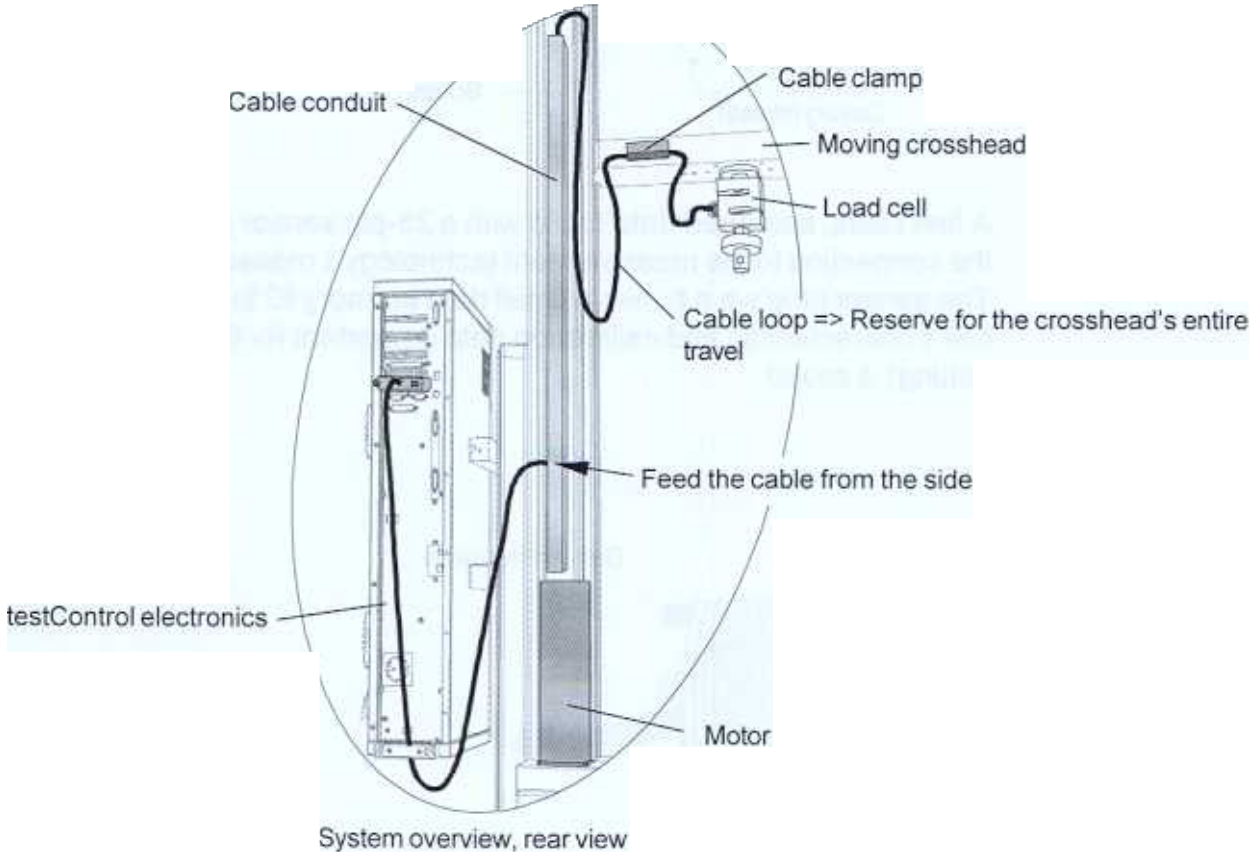
Cable guide

As the respective test requirements are so different, the followingrequested recommendations are to be observed and the corresponding measures are to be taken:

1) The load cell's measurement cable must not be subjected to any mechanical stressingor stretching at all over the entire crosshead travel.
   =>Feed the cable so that there is always sufficient available to avoid the above.

2) The load cell data cable must not be fed together with the motor's connection leads nor direct on the motor.
   => Feed the load cell data cable out of the cable duct above the motor.

3) Specimen remains must not damage any part of the load cell measuring cable at specimen break.
   =>Place the cable so that it is correspondingly protected.

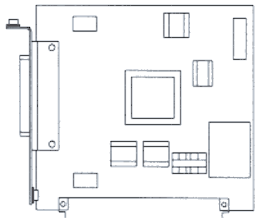


System overview, rear view

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Technical data



Order no. BTC-MODCSCC

Measurement range ..... 0,2 to 165 % of the nominal measurement value
Test data recording rate ..... switchable via software, maximal 500 Hz
Resolution at 100% nominal measurement value:
at 500 Hz test data recording rate ..... 162000 points
at 50 Hz test data recording rate ..... 297000 points

Type of measurement input .... Differential input
Zero-point, temperature dependent < 5* 10^{-4} %/K of nominal measurement value
Maximum linearity error .... +/- 0,01 % of measurement end value
Temperature range .... +10 to +45 °C

Dimensions:
Height ... 30 mm
Width .... 108 mm
Depth .... 135 mm

Connectable sensors

Strain gauge measurement bridges .... Full bridge
Type of connection ..... 4 and 6 lead technology
Nominal characteristic value, sensitivity .... 2 mV/V
Maximum characteristic value tolerence .... +/- 2 %
Permissible strain gauge bridge resistance ..... 100 to 1 200 Ω
Sensor supply voltage .... 10 V DC

Proper use

The TC-MODCSCC module is foreseen for connecting strain gauge full-bridge sensors. This module enables you to operate strain gauge load cells and also other strain gauge measurement bridge sensors in 4 and 6 lead technology.

Improper use

Inductive systems cannot be operated by the TC-MODCSCC module.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Fire fighting equipment

Fire extinguishers to DIN EN 2 combustion classes A and B may be used for combatting fire, smouldering and similar.
These are:

Combustion class A Burning of solid materials
Combustion class B Burning of liquid or liquefying materials

Support profile 061110.02

The support profiles for the materials testing machines are optional parts. To enable truely ergonomical operation for seated or standing operation, reference to the optional support profiles will be made quite often in this instruction manual.

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

No risk use

Specimen and jaw inserts may be used that will neither be propelled away from the test machine at specimen failure (break), nor will fall from the grips.

Hazardous use

A safety device must be used for all other test requirements. This is especially true for:

- Specimen with high potential energy and resilience properties, such as springs, ropes, belts and similar
- Use of hardened or ceramic jaw inserts

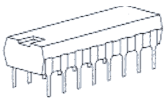
If potential sources of danger exist as, for example, defined by DIN 51233:

Danger:	Caused by:
- Risk of injury by specimen (or their constituent parts)	Them being propelled away from the machine, or falling to the floor
- Danger of squashing by specimen holders	Specimen holders that are not manually operated (e.g. hydraulic, pneumatic, electrical) with closing speeds higher than 10 mm/s
- Risk of injury through jaw inserts	Those made of hardened steel or other brittle materials (e.g. glass, ceramic, etc.)
- Danger of squashing parts of the body around the crosshead	At speeds above 10 mm/s
- Risk of injury by very hot or very cold parts and surfaces	When using temperature chambers

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

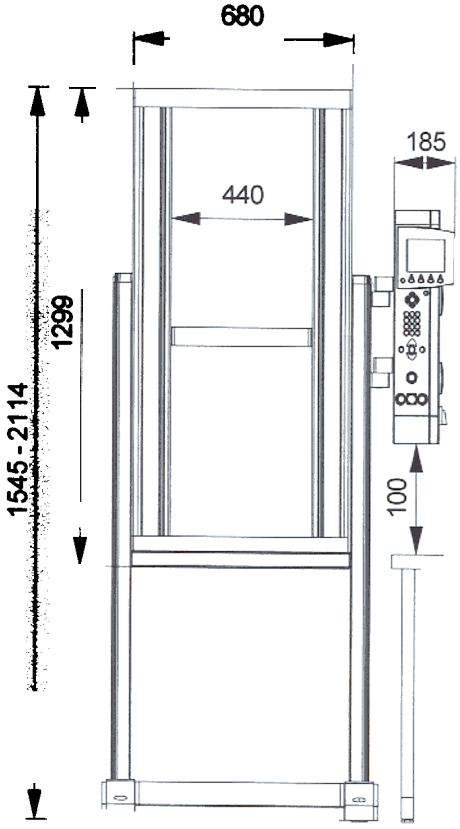
Electronic rating plate

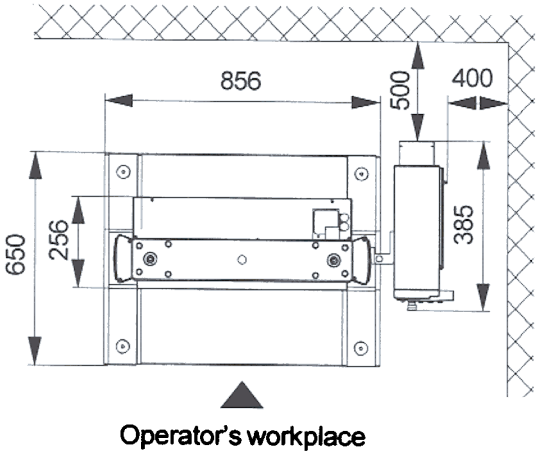


All of a materials testing machine's important data, such as the nominal force of the load application device, is saved to an electronic rating plate. This materials testing machine is thus capable of determining its own configuration.

Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

Technical data





Operator's workplace

Type/Order no.	BT1-FR005TN.A50

Load frame

Test load in tensile/compression	5 kN
Load frame height	1,299 mm
Overall height	1,545 to 2,114 mm
Load frame width	680 mm
Overall width	856 mm
Load frame depth	256 mm
Overall depth	650 mm

Weight:	
With electronics console	150 kg
With typical accessories, approx.	180 kg
Space requirements:	
Pure contact area	106 cm²
Load frame, area	5,564 cm²
Specific floor loading:	
Related to the typical accessories	1.70 kg/cm²
With 50% safety	2.55 kg/cm²
Floor loading:	
Related to the typical accessories	0.03 kg/cm²
With 50% safety	0.05 kg/cm²

Test area width	440 mm
Height of the lower test area w.o. accessories	1,058 mm
Height of the upper test area w.o. accessories (Crosshead is required)	1,034 mm
Finish	RAL 7011 and RAL 7038
Ambient temperature	+10 to +35 °C
Humidity, non-dewing	20 to 90 %
Noise level	67 dB(A)

Drive system

Crosshead speed	0,0005 to 3,000 mm/min
Accuracy of the set speed	0,03 % of V_{nom}
Drive system's travel resolution	0.041 µm
Positioning, repetition accuracy (W.o. reverse of direction)	< 1.0 µm
Maximum test frequency	0.5 Hz

Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

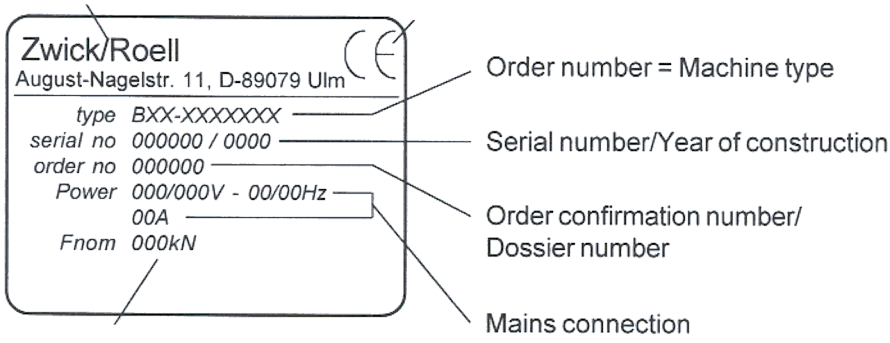
Identification

Each materials testing machine has two serial number plates as standard. A large serial number plate is on the electronics console ands a small one is on the rear of the machine base. An exception is the single screw materials testing machines, each of these has only one serial number plate.

Large serial number plate

Here is the CE sign for those materials testing machines that have a declaration of conformity.

Manufacturer with address

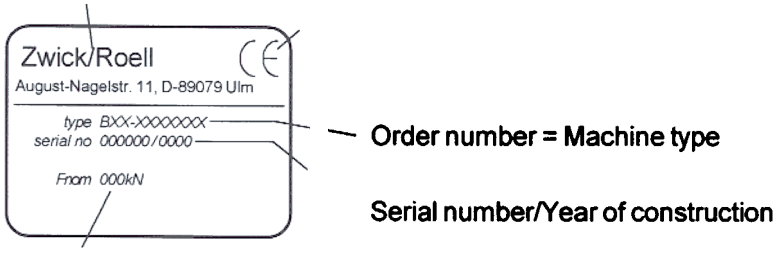


Nominal value of the materials testing machine

Small serial number plate

Manufacturer with address

Here is the CE sign for those materials testing machines that have a declaration of conformity.



Nominal value of the materials testing machine

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Your safety

This technical manual should make it easier for you to get acquainted with the machine and to use its range of applications.

This technical manual contains important remarks on transporting the materials testing machine correctly, safely and economically and on installing, dismantling and storing it. Pay attention to these remarks. They make it possible to increase the reliability and life span of the machine.

The instruction manual must be read and used by all persons authorised to work at and with the machine.

The entire instruction manuals must always be available at the test machine's installation site.

National regulations

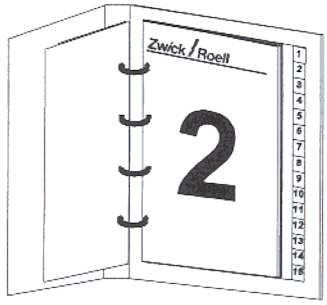
Supplement the technical manual with instructions from national regulations on accident prevention and environmental protection.

Observe and adhere to:
- Valid, binding regulations on accident prevention
- Recognised technical rules for safety and correct working
- Regulations on safety and health protection when preparing and using working means
- Instruction manuals

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Materials testing machine's instruction manual

Section 2:



General

In this section you can obtain data important for the materials testing machine and obtain information on our company and its products.

Document: **Technical manual**

Version: V 3.0
Print date: November 2005

All rights reserved

Tips, remarks and constructive criticism are welcome. Please direct these to:

Zwick GmbH & Co
Technische Dokumentation
August-Nagel-Straße 11
D-89079 Ulm

Fax: +49 - (0) 7305 - 200

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Proximity switch 13, 16, 21

R

Remaining risks 9
Risk of burning 11
Risk of frostbite 11
Risk of injury 11
Risk of slippage 23
Risk of squashing 18
Risk of trapping parts of the body 11
Rotating lead screws 17

S

Safety
- Devices 13, 16, 17
- Gloves 20
- Goggles 20

Safety devices 13, 16
Safety measures
- At operation 16
- Before switching on 16
- Ear protectors 20
- Specimen holders 18

Safety notes 16
Safety remarks 13
Service 21
Setup 13
Signal words 12
Specimen holders 18
Spring tests 19
State of the art 5
Supplements 5
Symbols
- Electrical voltage 11
- Laser beam 11
- Risk of burning 11
- Risk of frostbite 11
- Risk of injury 11
- Risk of trapping parts of the body 11

T

Tensile tests 18
Transport 6

U

Usage
- Improper use 8
- Proper use ... 7

W

Warning signs 13
Work
- On laser light sources 22

Working
- On hydraulic equipment 23
- On pneumatic equipment 23
- With electrical equipment 22

Working area 17, 18
Workplace 15

Copyright © 2002, Zwick GmbH & Co. D-89079 Ulm

Cleaning and disposal

Please adhere to the legal obligations for avoiding waste as well as disposing and recycling it.

Water pollutants must not pollute the earth, and they must not gain access to the sewer system!
Examples of water contaminating substances

- Lubricants and oils
- Hydraulic oils
- Coolants
- Cleansing fluids containing solvents

Used oil

Collect these pollutants in suitable containers. Transport, dispose of, etc. pollutants in an environmentally safe manner.

Please take note of remarks on disposal on all applicable and relevant safety data sheets. The enclosed safety data sheets are to be found in section 13 „Certificates/Calibration reports“
Dispose of all replacement parts safely and in an environmentally safe manner.

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

When working with electrical equipment

The leads from the mains cable(s) and mains input filters up to the input of the main switch are under current even when the materials testing machine is switched off.

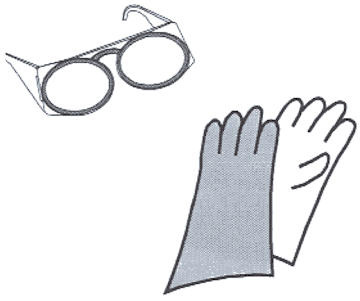
Maintenance and corrective maintenance work on electrical equipment must be carried out by competent and qualified electricians only!

Electrical equipment and systems should be checked regularly, at least every 4 years, for proper functioning (BGV A3) by qualified and competent electricians.
Please keep the switch console closed at all times! Access is only permitted for electricians with keys/tools!
Switch consoles/Housing for electrical equipment (Such as electronic housing, motors) should never come into contact with water nor steam (I.e. steam jet cleaners)!

When working on laser light sources

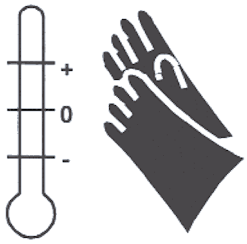
Only trained, competent and authorised personnel are to be allowed to work on laser equipment.

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm



Safety goggles, safety gloves
Risk of injury!
Example:
- Tests on specimen that shatter
- Tests with jaw inserts that might shatter
- Component testing

Everybody, even observers, must wear safety goggles if potentially dangerous tests are being run (EN 166) and/or protective gloves.



Temperature
Danger of burning or freezing!
Parts of the machine such as the motor can become very hot. The outer parts of temperature chambers and other parts, e.g. connectors, may become very hot or cold when testing with a temperature chamber.
Never ever leave hot/cold specimen lying around unprotected.
Only work with heat resistant protective gloves.

Noise
Loud specimen break can lead to damage to your hearing. Please use ear-protectors in such cases.

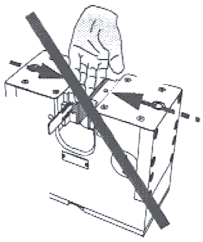
The materials testing machine doesn't emit any noise that could damage your hearing. The noise levels for the respective materials testing machines and their components are to be found in section 2 „Technical manual"

Laser extensometer
Safety goggles aren't necessary. Avoid looking into a laser light source and never use optical instruments to look into laser beams.

Working on laser equipment should only be done by correspondingly trained service personnel.

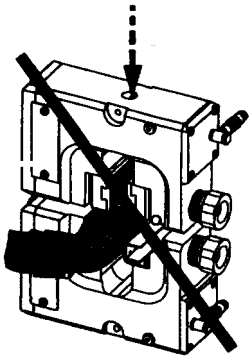
Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Working in the working area
Danger of trapping parts of the body.
Keep your hands away from the test area when the materials testing machine is running.

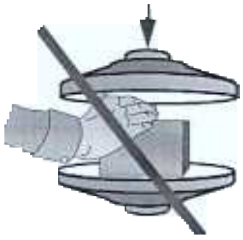


Specimen holders, hydraulic/pneumatic
Danger of trapping parts of the body.
Keep your fingers away from between the gripping jaws.
Use a tool, e.g. tongs, for inserting specimen!
Tongs are available for hydraulic grips.

Please make sure that any pneumatic and/or hydraulic equipment of, or for use with, the materials testing machine is at zero pressure before you start to work with it.



Tensile tests: Risk of squashing
Danger of trapping parts of the body.
There's a danger of trapping parts of the body after test during return to der initial position. There's a danger of squashing parts of the body especially between specimen holders that are close to one another, i.e. the free grip to grip separation is very small.
You must wait until the test is ended and the crosshead has stopped moving before attempting to access the working area.



Compression and flexure tests: Risk of squashing
Danger of trapping parts of the body.
There's a danger of squashing parts of the body during these tests whilst the compression platens or flexure test elements are in motion. Never ever attempt to access the space between compression platens or flexure test elements with parts of your body whilst a test is running.

Copyright © 2005, Zwick GmbH

Safety measures and notes

Before switching on

Please observe the following before switching the materials testing machine on:

- Only authorised persons may be allowed into the working area of the materials testing machine
- Check the all safety devices (Safety devices, limit switches, proximity switches and EMERGENCY OFF button) for evident malfunctions.
- Check the materials testing machine for visible damage! Report any determined damage immediately!

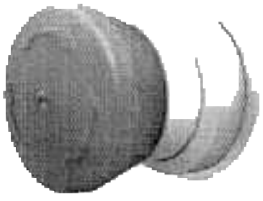
The materials testing machine must not be used at all if the following (Exemplary) defects are detected:

- Defects or damaged separating safety devices.
- Defects or damaged pneumatic leads.
- Defects or damaged hydraulic leads.

Defects must be rectified before putting the materials testing machine into operation.

At operation

Gather information on how to react in case of defects or damage before switching the materials testing machine on.
Non-observance could lead to injury.



EMERGENCY OFF button
In case of danger any movement of the materials testing machine must be stopped immediately by hitting or pressing the red EMERGENCY OFF button.

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

The test system must be operated by qualified and authorised operating personnel only.
The operating personnel must have some knowledge of:
- Safe operation.
- Suitable safety clothing.
- Any potential risks emanating from the test system.

The operating personnel must be instructed with respect to work safety and environmental protection as follows:
- Before the beginning of their work
- After any eventual alterations/amendments to the test system

however, at least
- Annually

The operating personnel must know the safety remarks contained in the instruction manual and adhere to them
The operating personnel wears suitable protective clothing (Safety goggles/face shield, safety shoes, protectice gloves, tightly fitting clothing, hairnets for long hair).

Please pay attention to the following as a user of hydraulic test systems:

Loss of oil could possibly occur during both operation or when the system is idle due to leakage. It could even occur during maintenance work. Loss of oil could cause environmental pollution (Ground water pollution) and could also be the cause of accidents.

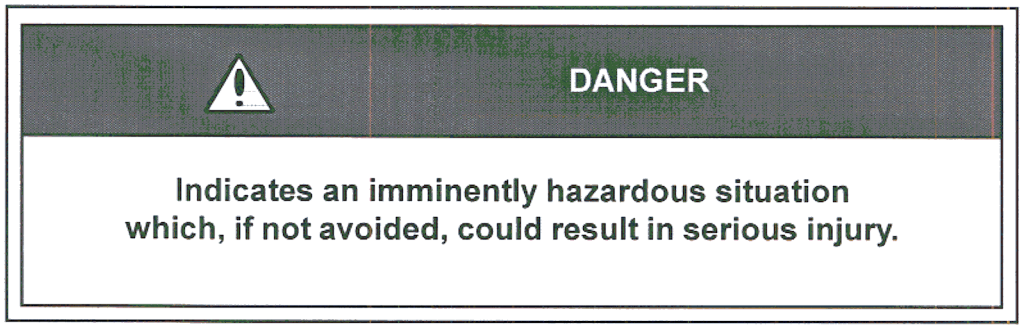
Please pay attention that hydraulic components are situated where it would cause no problems at all to accommodate the maximum quantity of oil which could be lost due to leakage. Oil sumps or similar können or specially built hydraulics-cellars can be used. Please make sure that hydraulic oil cannot penetrate into the ground.

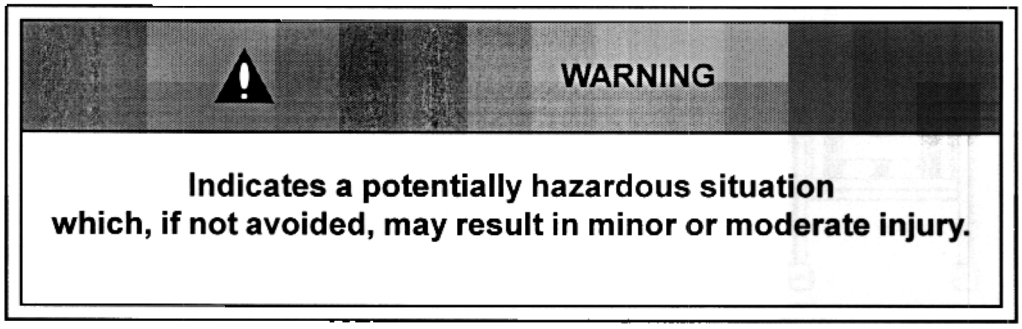
Please make sure that all valid rules and reugallations as well as laws and guidelines on the handling and disposal of (Hydraulic) oil(s) are strictly adhered to.

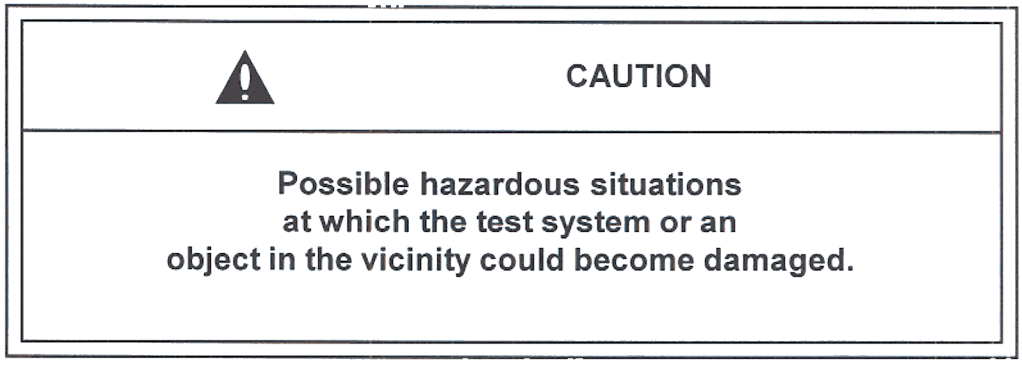
Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Signal words in the instruction manual

The instruction manual marks functions which may contain risks of injury for the operating personnel or danger for a device with the signal words as indicated below. These functions may only by carried out by trained operating personnel with due care and diligence.







Safety remarks with the signal word „DANGER“ or „WARNING“ may also contain hazards for test systems, accessories and the environment.

Copyright © 2005, Zwick GmbH & Co. D-89079

Furthermore, each of our materials testing machines is equipped with an EMERGENCY OFF button.

The safety device is used to protect the operator and the vicinity. Never ever shut down or override the functions of safety devices!

Checks and preventive measures

The following checks and preventive measures must be carried out independent of your running checks for any evident deficiencies.

Electrical equipment and systems should be checked regularly, at least every 4 years, for proper functioning (BGV A3) by qualified and competent electricians.
Please make regular visual checks of all hydraulic hoses. They must be replaced immediately if any damage is detected. According to DIN 20066 fluid technology, hoses hydraulic hoses should be replaced every six years at the latest as a precautionary measure.

Recommendation

All safety devices (E.g. EMERGENCY OFF button, limit switches, safety door, etc.) should be checked and maintained by an authorised person:

- Immediately upon detection of damage
- Following maintenance work
- At least once a year

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Improper use

Any usage listed or exceeding the proper use is recognised as being improper use. Zwick does not accept any liability whatever for damge resulting from any application or use not included under proper use. Liability is the sole responsibility of the user. The gurantee for the test system expires.

Examples of impermissible use:

- Amendments to the test system not agreed upon by Zwick
- Use of the testing system in the sense of a production machine if not agreed upon by Zwick
- Overriding safety systems

Zwick does not accept any liability for tools, appliances or devices integrated by the user. Any necessary safety measures are then the sole responsibility of the operator/user.

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Transport

Adhere to the regulations governing safety and health protection at work (Liability of the system supervisor) when making work means available. These are, amongst others:

- Instructing the employees
- Proper use of transport means and lifting tackle
- Personal safety equipment

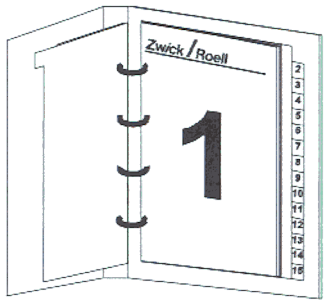
Transport of the test system and accessories is described in chapter „Transport" in the installation manual. Zwick does not accept any liability whatever for the use of any types of transport other than that described in this chapter.

Copyright © 2005, Zwick GmbH & Co. D-89079 Ulm

Copyright © 2003, Zwick GmbH & Co. D-89079 Ulm

Materials testing machine's instruction manual

Section 1:



General

This section contains information that is important for maintenance and service for your materials testing machine and the accessories.

The safety manual must be read and used by all persons authorised to work at and with the machine.

Document: **Safety manual**

Output: V 2.9
Print date: November 2005

All rights reserved

Tips, remarks and constructive criticism are welcome. Please direct these to:

Zwick GmbH & Co
Technical documentation
August-Nagel-Straße 11
D-89079 Ulm

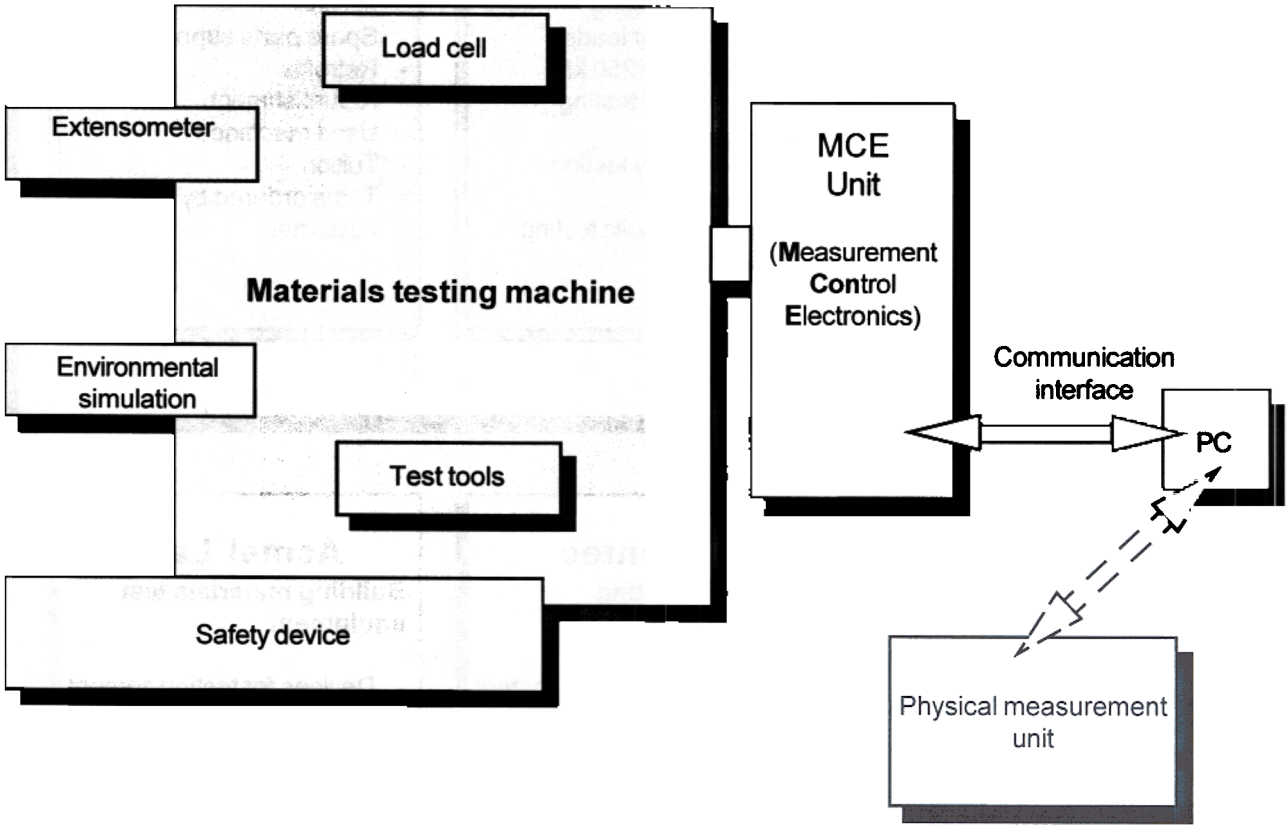
Fax: +49 - (0) 7305 - 200

Copyright © 2003, Zwick GmbH & Co, D-89079 Ulm

Product description

Zwick materials testing machines can be put to universal use. They are concipated for almost all test requirements for nationalen and internatio-nal standards, as well as for a large part of the requirements as described by a wide range of „in-house standards".
Thesematerials testing machines are not only for use in quality assurance for rotine investigation, but also for research whereby test programs must first be defined.

Overview:



The modular construction enables supplementary retrofits to be made very easily.

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Zwick Roell AG

Zwick Roell AG
August-Nagel-Straße 11
D-89079 Ulm-Einsingen
Tel.: +49 7305- 100
Fax: +49 7305-10200
eMail: info@zwickroell.com
Internet: http:\\www.zwickroell.com

Zwick
GmbH & Co. KG
August-Nagel-Straße 11
D-89079 Ulm-Einsingen
Tel.: +49 7305 100
Fax: +49 7305-10200
eMail: info@zwick.de
Internet: http:\\www.zwick.de

Zwick Series
Zwick projects
ZwickService

Certified to ISO 9001 and EMAS
DKD accredited to ISO/IEC 17025
no. DKD-K-13201

Toni Technik
Baustoffprüfsysteme GmbH
Gustav-Meyer-Allee 25
D-13355 Berlin
Tel.: +49 30 64403921 / 23
Fax: +49 30 64403922
eMail: info@tonitechnik.com
Internet: http:\\www.tonitechnik.com

Certified to ISO 9001
DKD accredited to ISO/IEC 17025
no. DKD-K-23301

Indentec
Hardness Testing Machines Ltd.
Lye Valley Industrial Estate, Bromley Street
Lye, Stourbridge
West Midlands DY9 8HX · Great Britain
Tel. +44 1384 896949
eMail: mail@indentec.demon.co.uk
Internet: http:\\www.indentec.demon.co.uk

UKAS-accredited to ISO/IEC 17025
no. 0232

Acmel Labo
10/12 Rue de l'Orme Saint Germain
F- 91160 Champlan
Tel.: +33 1 69109595
Fax: +33 1 69100186
eMail: info@acmel.fr
Internet: http:\\www.acmel-labo.com

Zwick Asia Pte Ltd.
Singapore 609916
Tel.: +65 8995010
Fax: +65 8995014

Zwick Testing Machines Ltd. (GB)
Leominster, Herefordshire HR6 OQH
Tel.: +44 1568 613516
Fax: +44 1568 612626

Certified to ISO 9001
UKAS accredited to ISO/IEC 17025
no. 0167

Zwick USA LP
Kennesaw, Atlanta, GA 30152
Tel.: +1 770 4206555
Fax: +1 770 4206333

A2LA accredited to ISO/IEC 17025
no. 1891.01

Zwick France S.a.r.l.
F-95971 Roissy Airport
Tel.: +33 1 48632140
Fax: +33 1 48638431

COFRAC-akkreditiert nach ISO/IEC 17025
Nr. 1-1213

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

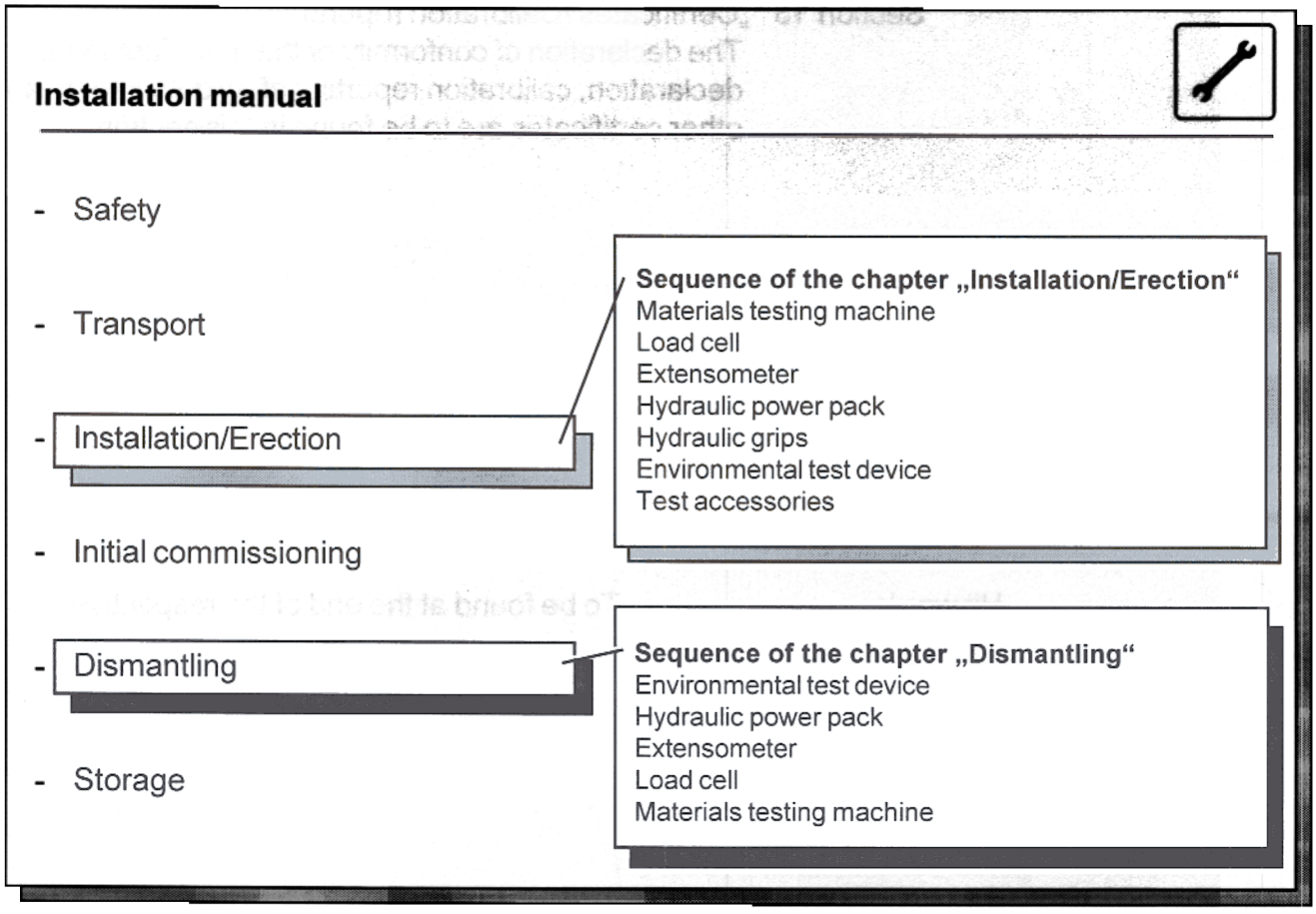
The instruction manual is structured to the same repetitive pattern
The single chapters are compiled in the sequence:

- Materials testing machine
  - Load cell
    - Extensometer
      - Power pack (hydraulic/pneumatic)
        - Test tools
          - Environmental test device
            - Test accessories.

Exception is dismantling (See the example on this page).

Some parts of the manual may not be included in your manual as the manuals are supplied for that equipment as per the configuration of your materials testing machine. Some chapters don't require a detailed description for certain parts.

The next diagram shows how a section in the instruction manual is compiled, using the installation manual for a materials testing machine with hydraulic power pack, test tools, extensometer and temperature chamber as an example:



Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Should you resell your materials testing machine, you must also provide your customer with the instruction manual. The complete instruction manual is an integral part of the materials testing machine.

Instruction manual's structure

Read through this short introduction and you'll be able to find the theme that interests you more quickly as this introduction informs you where and how you can find your way.
The instruction manual is split into different categories:

Important for everybody

Section 1: „Safety manual".
The contents must be known to everyone.

For the technicians

Section 3: „Installation manual".
Aimed at personnel responsible for transport, installation, dismantling, packing and storage.

Section 4: „User manual".
Aimed at operating personnel and describes the operation/operating elements of purchased components.

Section 10 „Service and maintenance manual".
Aimed at maintenance personnel with maintenance intervals as well as error rectification.

Section 11 „Circuit diagrams"
Aimed at maintenance and service personnel.

What everybody needs

Section 2: „Technical manual".
Contains the technical data.

Section 15 „Appendix".
Contains addresses and a maintenance order form.

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm

Materials testing machine:	**T1-FR005TN.A50**
Serial number:	**168336**
Order confirmation/Dossier number:	**653782**
Model:	**2005**

Manufacturer:
Zwick GmbH & Co
August-Nagel-Straße 11
D-89079 Ulm
Germany

Customer service:
ZwickService
August-Nagel-Straße 11
D-89079 Ulm

Telephone: 07305 10-0
Hotline: 07305 10225 — Help for malfunctioning
Supportline: 0190 8 81988 — Support for operation and application
Fax: 07305 10200
eMail: info@zwick.de
Internet: http:\\www.zwick.de
http:\\www.zwick.com
Further addresses from service and sales companies are listed in the appendix.

Document: Instruction manual „Materials testing machine“ is split into:

- Safety manual
- Technical manual
- Installation manual
- User manual
- Service and maintenance manual

Version: See the respective manual
Print date: November 2005

Copyright (c) 2005 by Zwick GmbH & Co.
August-Nagel-Str. 11
D-89079 Ulm-Einsingen

All rights reserved

We've done our best to make sure that this instruction manual is complete and free of errors. Should you notice anything that is unclear in spite of this please inform us. Our products are being continuously improved upon. Thus it may happen that some statements in this manual don't always correspond to the latest state. Exact info can be obtained by calling Zwick in Ulm if you're not entirely sure.

Copyright © 2004, Zwick GmbH & Co. D-89079 Ulm